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February 10, 1937

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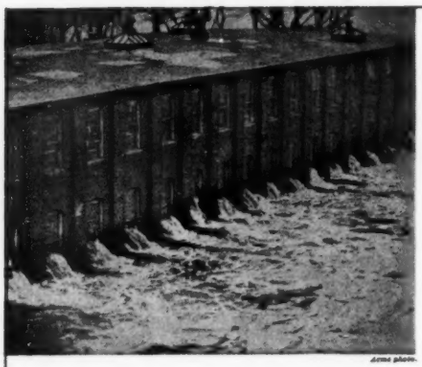
If your plant was flooded...



Acme photo.

If your plant was one of those hit by the rising waters you will want to know how to minimize your loss by putting your equipment back into production without delay or damage

FLOODED OUT

WATER swirled through many an industrial plant last week, suspending operations and leaving havoc in its wake. Pennsylvania and New England were hardest hit, but Ohio, West Virginia, Maryland, and New York also felt the grip of the flood.

As the water recedes, a tremendous job is left to the plant forces in putting the equipment back into running order. The action of the flood has been destructive, and the clean-up job will be expensive. It is a good time, therefore, seriously to consider replacement of those units of plant equipment that are slated to go in the near future. There is little to be gained by spending good money on obsolete machines.

The greater part of the equipment, however, must be restored to production as promptly as possible. In this discussion particular reference will be made to machine tools, but in general, most of the remarks will apply to all plant machinery.

Flood waters always carry abrasive silt. If this is not thoroughly removed, wear will soon destroy the precision of the equipment. The first job then is to remove all silt from the plant with hose, broom and shovel. This preliminary housecleaning job should be done with care, for as the silt dries out it will form dust which may again find its way into the equipment.

The next step is to get the silt out of all moving parts which in most instances means a thorough job of dismantling. In such machines as lathes, planers, boring mills and grinders the safest method is to strip the machine right down to the bed. Small unit subassemblies should be taken apart on a bench and each piece cleaned with gasoline, or better still, dry cleaners' solvent which is non-inflammable. Screws, keys, nuts and other small parts can be put right into a can of the cleaner. Castings and the larger parts can be washed with paint brushes or rags. Special attention must be given to oil holes and oil grooves.

Acme photo.

High water put out the fires at Binghamton in the hardest hit sections of New York State

Another machine element requiring extra attention is anti-friction bearings. These, too, should be disassembled if their construction permits, as any grit remaining in them will be highly destructive.

Oil sumps should be drained and cleaned out completely; oil pumps must either be disassembled and washed or flushed out first with solvent and then with oil. After all loose dirt has been removed, the bed of the machine should be gone over with solvent and a paint brush.

In a few cases, where rust has gone below the surface of the metal, a rescraping job may be in order. Usually this can be avoided, but when essential, it should be carried out so as to preserve or improve the machine alignment. During reassembly of the parts and re-erection of the machine, the methods adhered to in machine tool building must be followed. Metal-working shops unfamiliar with such methods will do well to consult the manufacturers, as otherwise the accuracy of their equipment is almost certain to be impaired.

Roller or silent chain should be soaked in solvent or, even better, be run through the solvent by laying it over a revolving sprocket. The motion will tend to dislodge the dirt that collects between the many bearing surfaces. A bath in lubricating oil is advisable before the chain is returned to the machine.

MARCH 25, 1936

here are suggestions for getting it back into production with minimum delay and damage

At the time of the great floods a year ago, American Machinist prepared this article, which gives many practical ideas on how to rehabilitate a plant which has been flooded. It covered such things as cleaning silt out of machinery, drying and testing electrical equipment, cleaning and drying transmission belts, etc. It can help any plant today that has suffered in the floods.

Copies of this article will be supplied immediately on request

Address: AMERICAN MACHINIST, 330 WEST 42ND STREET, NEW YORK

Talking Shop

Shop Glare

Glare from direct sunlight on roofs or side windows of machine shops may be just as much of a handicap to production as too little light. We remember vividly entering a new shop once where the whole side wall was made up of windows fitted with hammered glass. It was late in the afternoon and the effect of the nearly horizontal rays of the sun, broken up by the hammered glass, was like a blow in the face. The men in this

shop whose machines faced the light were using eye shades and colored glasses to save their eyes but the strain was visible on every face.

One of the good old-fashioned ways of curing this evil is to paint the glass blue, but the effect is simply to cut out most of the light, and make the shop look sloppy and unkempt. After all, why go to the expense of putting in the glass if you are going to cover it with paint? Up in New England they are trying another way of killing the glare. Blue cellophane bought at the five-and-ten is being glued to the glass. So far the results are most satisfactory. The cost is insignificant.

Railroad Shop Bottlenecks

According to two of our good friends who are in charge of locomotive repairs on live railroads the boiler shop is the bottleneck that keeps motive power from getting back into service promptly. One narrows it down to the delays in testing the boilers and putting on the lagging, jacket and pipe work. This, he thinks, is more difficult to plan in boiler work than in the machine shop.

The other man feels that not only is too much of the boiler shop machinery out of date but that not enough attention has been paid to training young men in this very important department. There is nothing attractive about the boiler shop for the young man.

In years gone by the foundry often offset its corresponding handicap by shorter hours, if not higher pay. Perhaps the boiler shop might secure more and better men by similar methods.

Measuring Roughness

Several ingenious devices for measuring the roughness or smoothness of a machined or ground surface are in use, but one of the simplest we have seen is being applied in the testing laboratory of one of the oil companies. A pencil "lead" of standard quality is applied to the surface under standard conditions and the amount of graphite rubbed off is measured. Obviously, the smoother the surface, the less the loss in the abraded medium. The method may not be perfect but it seems to give comparable results.

Flat Drills

We are apt to think of the flat drills as belonging to the old and bygone days when carbon steel was king and the twist drill was a new fangled contraption regarded with considerable suspicion. But high speed flat drills are now available and have made a real field for themselves in

sizes from 0.002 to 0.080 in. They are made with different cutting and clearance angles to suit the material to be drilled. It is claimed that they drill very accurate holes.

Where Experience Counts

Job shops, especially those whose machine and tool equipment ceased to be modern several years ago, need men of skill and experience. An instance of this came up recently in connection with the boring of a mold to be used in the casting of pipe by the centrifugal method. The bore was about 24 in. in diameter by 48 in. long, and there was evidence of chatter even before you got very close to the machine.

Examination showed that both cutting tools projected over 4 in. from the boring head which was mounted on a rather light bar because the next larger head wouldn't go in the bore. So the old timer

had put a heavy flywheel on the outer end of the boring bar where it projected through the outer support. When questioned he said, "It helps some. If you think it chatters now you ought to have been here before I put that wheel on."

It might be a good idea to expose every apprentice, before he finishes his training, to the test of getting good work out of a bad machine. The best teacher would be an old timer with a long experience in meeting such tests. After all, there are not so many shops where all the equipment is new, and not all apprentices are lucky enough to land in model shops. —*The Editors.*

Speed by Arbitration

K. H. CONDIT
Editor

Is it feasible to arrive at the operating speed of a manufacturing conveyor by mutual agreement between men and management?

ONE of the eight demands made by Homer Martin's United Automobile Workers on the General Motors Corporation is that the speed of the assembly conveyors be set by collective bargaining. This demand will bear examination because it is fundamental to the conduct of the whole automobile industry as at present organized.

Mr. Martin and his associates claim that conveyors pace production, and that they are being used as slave-driving weapons in the General Motors plants. They have been broadminded enough to promise to start trouble for the same reason at the Ford and Chrysler plants as soon as they have cleaned up General Motors.

Admitting, for the sake of argument, that the production executives are indifferent to how hard their men have to work, it must still be remembered that there is keen competition in the automobile industry and that the finished product must pass rigid inspection before it leaves the factory. Cars of inferior quality will wreck the reputation of any manufacturer in short order, even if only a few get into the public's hands.

Now, it is generally understood in the industry that overworked operators cannot be counted on to turn out a perfect product. If they produce two more cars in a day and both of those cars are below standard the net result of the attempt to speed up operations has been a loss.

This same principle operates everywhere, of course. A professor of engineering who has made careful studies of the performance of college students reports that after a boy has been loaded up to his capacity, every attempt to add an hour or so to his schedule or increase the difficulty of his assignments results in a lowering of his grades.

Workers on this assembly line are not troubled by the speed-up

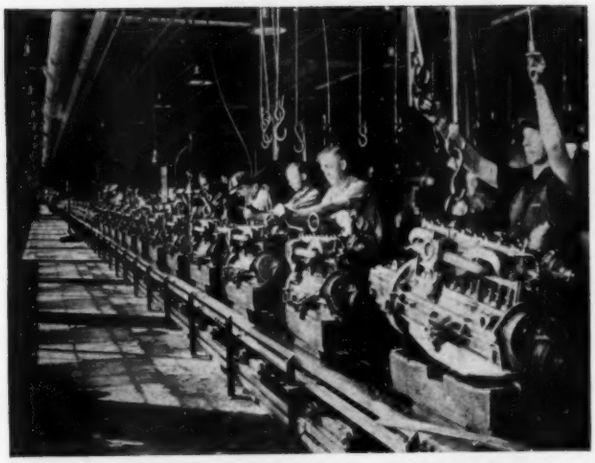
In the automobile industry enough time studies have been made over a long period to give the management a very definite idea of how much work can be done by a man without reduction in its quality. It is hardly reasonable to believe that they will expect more than this performance or that they will take chances of trouble by approaching too close to the limit.

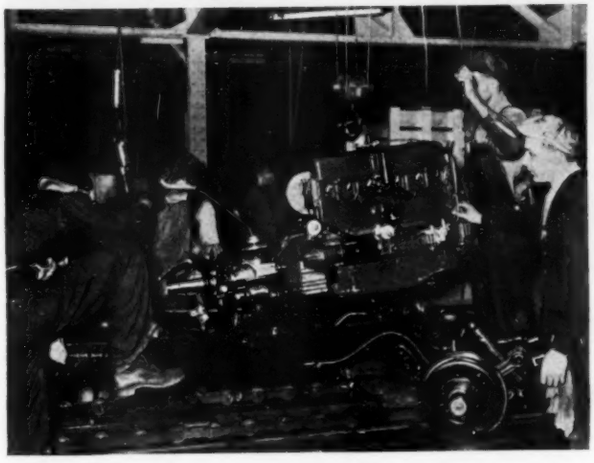
But we must face the question of who shall determine how fast the conveyor shall run. Not so many years ago an unscrupulous foreman anxious to make a showing might surreptitiously step up the conveyor speed and drive the men on it to unreasonable exertions. Though such an action might be absolutely contrary to company policy and against definite orders, it happened often enough to give the agitator a grievance to complain about.

Charges Unfounded

No one in the industry who knows the General Motors executives places much credence in the charges made by the C.I.O. leaders that inhuman speed-ups are being indulged in, and are serious enough to be a reason for calling a strike. They know that the policy has been to pay a reasonable wage and to expect a fair day's work in return, and to dismiss a man at the end of his shift with sufficient time, spare cash and energy to enjoy running his car and using the other minor luxuries that the American standard of living puts within his reach.

On the other hand, the general public has no such knowledge of the facts. It is much more likely to hear the broadcasts and read the propaganda of the C.I.O. group and to visualize conditions as being like those satirized in the Chaplin





As many men as are needed are assigned to each station

film "Modern Times." Unfortunately, a good many people in official life are no better informed on this subject than is the general public.

The attitude of the men on a conveyor line towards the speed at which it is being operated depends a lot on how satisfied they may be with their pay and working conditions. There are plenty of examples of the way in which this attitude varies but one typical one will suffice here. In the meat packing plant of George A. Hormel & Co. in Austin, Minn., most of the employees were put on a weekly salary basis a couple of years ago. Before that time there was constant bickering about the hardships of being paced by a conveyor that moved too fast. After the change in payment method, according to an article in Factory Management and Maintenance for August 1935, the whole viewpoint changed. "We have, you see, a given amount of work to turn out in any one day, whether it be 2,000 hogs or 6,000. We set the men to do this task at starting time; when they finish they may go home. Whatever hour they get through, they still earn the same weekly pay. Now the men complain because the conveyor that paces them operates so slowly that they feel they are kept longer hours than necessary. *This is the same conveyor that used to work them to death, the only difference being that we have speeded it up somewhat in accordance with their desires.*"

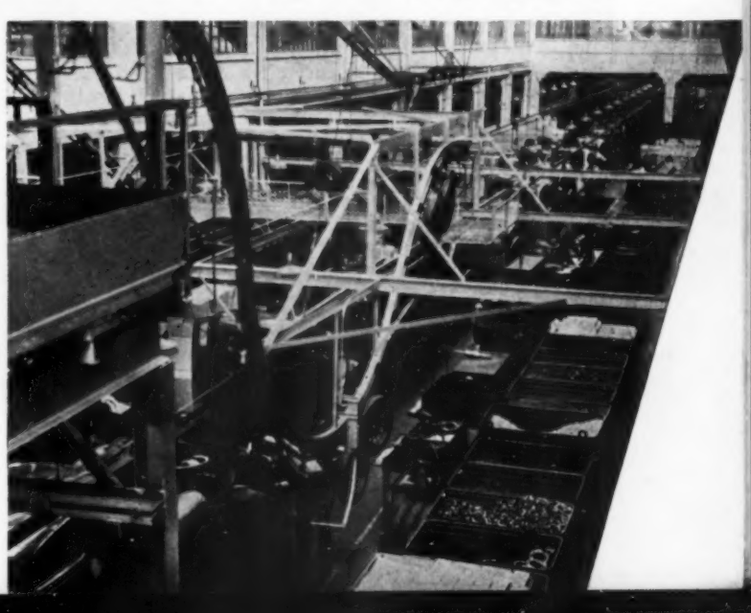
Processing hams is one thing, manufacturing automobiles by the hundred thousand is quite a different one. Hams are disassembled from the pig, automobiles are assembled from many separate parts and sub-assemblies each of which represents a major manufacturing problem by itself. In the packing business conveyor speed affects few besides those actually working along it. In the automobile business, however, it affects men elsewhere in the same plants, and men in other plants; it affects transportation methods and timing, and the people in that field.

Adjusting conveyor speed to suit the notions of a union bargaining committee would therefore be a far more complicated question than appears on the surface. In fact, such a policy might easily lead to the same complete breakdown of production about which the Soviets are complaining as a result of the bureaucratic meddling that is inseparable from their political set-up.

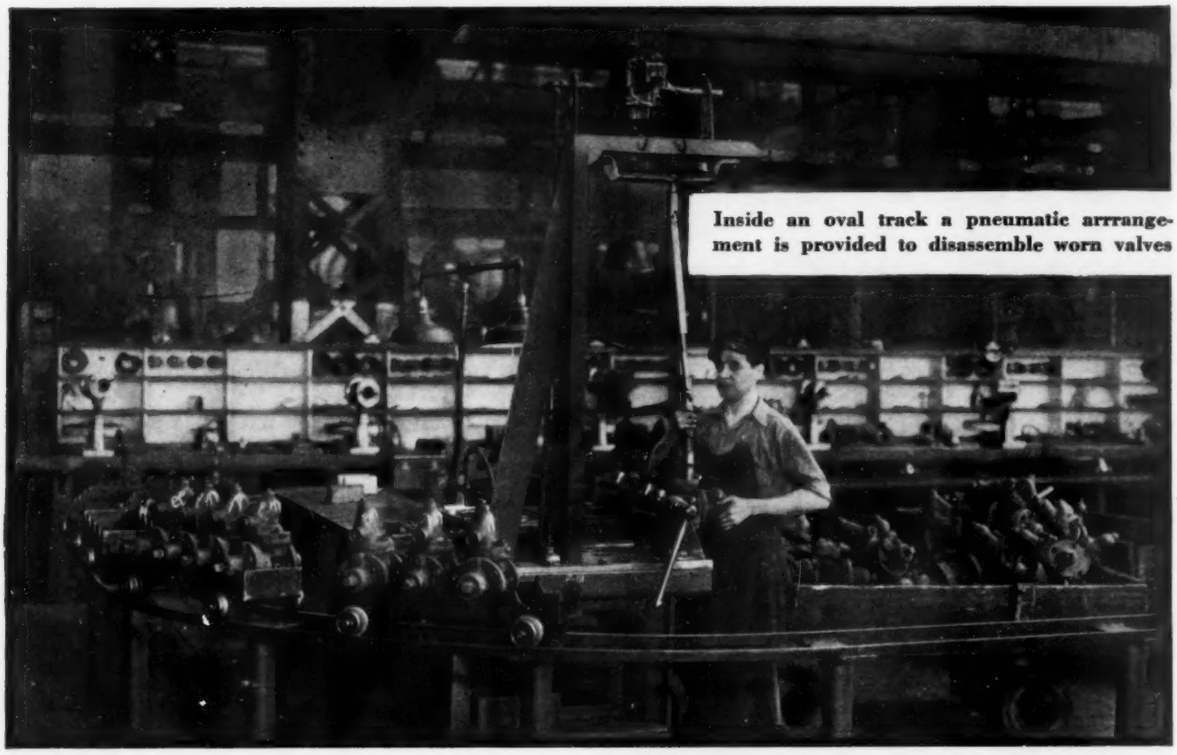
It is clearly not to the interest of the automobile executives to speed up a production line to the point where the strain on the men makes human failure a threat. Every practical and humane consideration is against it. Automobiles have to be sold to a critical public. They cannot be sold to buyers who are convinced that they were made by slave-driving methods, and who dislike the maker in consequence.

If the management has allowed conveyor speed to get too high for some of the men working on the conveyor they should certainly protest, and that protest should be given immediate consideration. If the speed must be held to keep the production machine in balance more men can be added to the line at the spots where the situation is critical until the load on each one is not more than it should be.

As a matter of fact it is practically impossible to arrange even conveyorized production so that every man involved works at exactly the same speed. The work is such that it is limited by certain bottleneck operations that may be controlled by machine speeds or by the fact that the adding of more men would hamper the movements of all because of lack of room. If there is not room for more men then the whole organization will have to be slowed down. But any such operation is a major management problem because of the many factors that have to be adjusted and is hardly a subject for arbitration with a group that have not and cannot possibly have all the facts needed for an intelligent decision.



Parts and subassemblies are brought to the line so as to demand the least effort from the assemblers in handling them



Inside an oval track a pneumatic arrrangement is provided to disassemble worn valves

Valve Repair *at Sayre*

Well planned use of conveniently placed equipment effects economies in railroad shop maintenance

CHESTER H. FRANKLIN

BRAKE VALVES of various kinds require careful, regular inspection and repair because they play such a vital part in railway safety. When these valves come in for overhaul they must be carefully taken apart, cleaned, parts replaced if necessary, or repairs made of one kind or another.

Air brake repair work has received much attention at the Sayre, Pa., shops of the Lehigh Valley railroad. The work has been concentrated into a compact department, and means have been provided for handling the work easily and efficiently. At one side of the department is a long bench provided with a special shelf arrangement in which the parts of valves under repair can be placed for safekeeping. On the bench, in front of the shelves, are special vises or stands which hold the valves during repairs and assembly.

In front of the bench is an oval track, raised at a convenient height from the floor. On this track are small steel cars, or trucks, each holding four valves. A section of this track is removable to permit access inside the oval, for men and for trucks with valves to be repaired.

Near the track is the machine for unscrewing nuts and bolts that have been in place too long to come out easily. An air motor at the top drives the shaft through the reduction gears. The shaft is telescoping and has two universal joints to insure complete flexibility. Sockets that fit all the nuts and bolts used on the valves are kept in the rack in front of the operator and are easily interchanged.

A special vise holds the valve while the nuts are being loosened, and the valves are then placed in one of the small trucks shown and pushed around the track to the men working at the bench. Valves are then cleaned, gaskets replaced, if necessary, and valves and valve parts, tested to gage. This procedure saves a lot of work for the men at the bench and puts the work of repairing brake valves on an efficient basis.

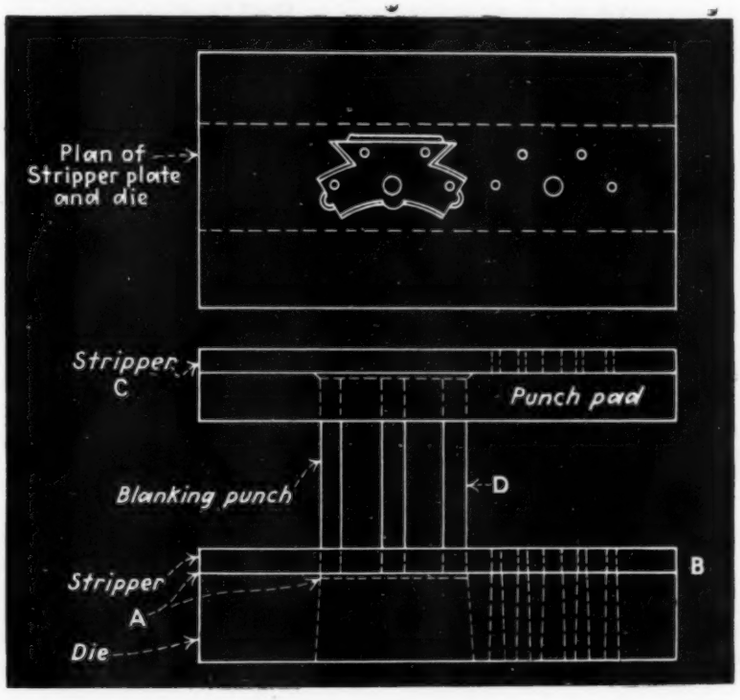
Holes in a Punch Pad

CHARLES WESLOW

Using the stripper plate as a jig avoids drill run-out, and if the spindle is square, gives a true job

SOME DIEMAKERS place a pair of parallels between the die and the punch pad when in the drill press in order to transfer the piercing holes into the punch pad. They insert the blanking punch into the die about 1/32 in., and then hunt for a pair of parallels that will fit nicely between the die and the pad, but usually they have to use two or more pairs of parallels before they find the size that will fit. Even so, their drill is revolving in thin air between the die and the pad with no guide whatever. They merely trust to luck. Imagine a jig designed to allow a drill to wiggle waggle through all that space.

My method is to use the stripper plate for a jig. In the plan of the stripper plate and die, you will note around the blanking portion of the die, are fine lines that represent clearance for the punch. Where no fine lines are visible is where the punch fits snugly into the stripper plate. The stripper is left large enough all around the outside, until it is placed on top of the die with the punch protruding through 1/32 in. which is inserted into the die as at *A*. The stripper is then machined off all around the outside to the same dimensions as the die as at *B*. The same is done with the punch pad. It is obvious that the piercing holes in the die can be easily transferred into the stripper plate that way. If the stripper and punch pad are machined to the same outside dimensions as the die, then it follows that the stripper plate can be located on top of the punch pad as at *C*, and the holes that are transferred into the stripper can as easily be transferred from that unit into the punch pad, from the top of the pad, presuming that the diemaker will line up both members all around the outside. If the blanking punch did not warp out of shape in hardening then one could slide the stripper plate over the blanking punch and transfer the piercing holes from underneath the pad, but punches always expand at *D* from hardening, no matter what kind of steel is used to make them. Therefor, if the punch fits snug at the cutting edge, into various spots of the stripper, the latter will not pass over the swelled up portion of the punch, and if it is filed out so that it will pass over, then one is not sure if it can be located onto the punch pad accurately. Then again the punch may not be inserted into the pad square, which may be enough to throw the stripper out of line.



Open With Counterbores

After the piercing holes are transfered into the pad, those spots where the punch fits snug in the stripper, are filed away so as to give the stripper the proper clearance all around for the punch to pass through. The transferred holes in the pad are opened up to the reamer size of the shanks on the piercing punches with a counterbore. But don't drill through until you get your counterbores first and then use a drill the same size as the pilot on the counter bore. I have my own counterbores for such work with various size pilots on each. If I want to open up a transferred hole that is, say ⅛-in. in diameter to a 5/16-in. reamed hole, I use my counterbore that measures or cuts seven or eight thousandths less than 5/16-in., and that same counterbore has a pilot that measures ⅛-in.

Lots of diemakers seem to think that the use of counterbores are confined to counterboring for screw heads. I never depend on counterbores out of the tool crib but on what I have in my tool box which are sharp. Lots of men have asked me for the lend of certain counterbores, but I usually don't "happen" to have what they ask for. That seems to be the only way I can keep them in good condition. I made them strictly for my own use; not

for others to borrow and dull for me.

When through using the stripper as a jig, it is then prepared for use as a stripper, milling a groove through as shown with dotted lines for the stock to pass through, the holes for the piercing punches opened up for clearance, and screw holes transfered along with the dowel holes.

In my time I saw diemakers swing the pad and die on the face plate of the lathe, with a parallels between, indicating one hole after another, removing the die each time, just to transfer the piercing holes.

I always leave the shanks of piercing punches soft enough so that in case they are out of line a thousandth or two, I can bend them over with a hammer. Unless piercing punches are ground to size all over, they are likely to be warped from hardening too much to expect them to line up with the die holes. That's why I leave the shanks soft enough so that I can bend them in place.

I always have the piercing punches about 1/64 in. shorter than the blanking punch. I lay the punch pad down on the bench and lay the die on top, with the blanking punch inserted into the die 1/64 in. I then look down through the piercing holes with a magnifying glass to see how they line up.

When they are lined up, I grind off the blanking punch to the same length as the piercing punches. Sometimes I back up the piercing punches 1/64 in. instead of making them shorter.

When it comes to drilling the holes in the stripper plate, one can work very accurately with a drill press, but see that the plate stands square with the drill press spindle. Whenever I start using a drill press that I never used before, I fasten my drill press attachment for my indicator, in the drill chuck, and revolve it around by hand to see how much the table is out of square if any. By lowering the spindle to a positive stop, one can set the indicator so that it just touches the table. If the table in a radius of eight inches is out only 0.002 in. it is good enough for drilling holes square. If it is out more than that amount, use a pair of parallels, shim them up the difference, and lay the plate onto the parallels. That goes when drilling anything else that needs to be drilled square. The indicator attachment I refer to is nothing more than a piece of drill ¼ in. in diameter, bent at a right angle and flattened out on one end, with a hole at the extreme end to which an indicator can be fastened. In one shop where I was once employed, they had an auxillary table for the drill press, having four set screws underneath, which were held in position with a lock nut. The four screws laid on the regular drill press table and had been adjusted so that the auxillary table was square with the spindle. Due to the burr being thrown out when a drill bores through a plate is why it is best to lay a plate or other job into a pair of parallels. Its a wonder to me that drill press manufacturers don't design a medium size drill press so that the table will not sag.

If it's a face plate of a lathe, one can true it up easily. And never expect to drill a hole square with the face unless the drill runs true. The same applies to finishing a hole with a machine reamer. Considerable pressure is required to drill a hole for a 3/8-in. dowel if using a regular size reamer drill. Therefore the table is likely to bend down at the outer end. I get around that by drilling a smaller hole first and follow that up with a reamer drill. There are so few young men who do not realize that a drill must be sharpened to the proper angle, and that the lips must each be the same length in order to be sure to get the best results.

What Was This Tool Used For?

C. H. WILLEY
Superintendent of Manufacturing, Hoyt Electrical Instrument Works

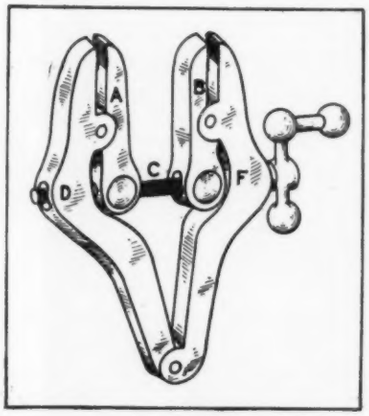
I HAVE the tool illustrated in my possession, but I don't know what it is or what it was used for. I have shown it to all the boys in the shop, but not one has been able to tell me anything about it, though some have said that they believed it was used by a harness maker.

The jaws *A* and *B* open about ¼ in. when the right- and left-hand screw *C* is turned in one direction. The first action on closing the device is that the jaws *A* and *B* close tightly and, as the screw is turned further, parts *D* and *F* move toward each other until jaws *A* and *B* are touching back to back.

When the device is closed, the first action on reversing screw *C* is that the jaws *A* and *B* open and stay open until parts *D* and *F* return to the end of the screw travel. The action of the tool indicates that it grips two pieces of work in its jaws and then the two vises are drawn together while some kind of work is being performed.

The tool was found in an old tool chest on a farm. It may have been made by some ingenious village blacksmith, but what is it and what was it used for?

This tool was found in an old tool chest on a farm. Can any of the readers tell what it is and what it was used for?



Plea for Publications

T. GUNTHORP

WITH all the twaddle that is being thrown about training mechanics, I believe you are still overlooking the easiest and cheapest means at hand—I refer to trade publications and catalogs. It is like pulling teeth for the ordinary mechanic to get hold of them; yet because our school system has prepared him for it, he could make much use of the "book larnin'" contained in them.

My proposed remedy is quite simple, and could be tried without much expense. Persuade your advertisers to set a price, payable in stamps, for which they will send out such publications without asking any questions about "title," "firm," etc.

Such a price should not attempt to support the whole advertising budget—just enough to cover paper, ink and postage, so the man who wrote for it would have to be readily interested.

Are you **Liable** *for your product?*

Court precedent says "yes" and damages may far exceed the price of the parts furnished

LESLIE CHILDS
Attorney at Law

WHERE a machine shop, foundry, or other metal-working establishment undertakes by special contract to manufacture machine parts, with full knowledge of their use and purpose, it will as a general rule be liable for all damages resulting from defects therein. And here, *all* damages does not mean merely the price of the article manufactured, for if the buyer in his attempted use thereof suffers other damages this, too, may be charged to the manufacturer of the defective part.

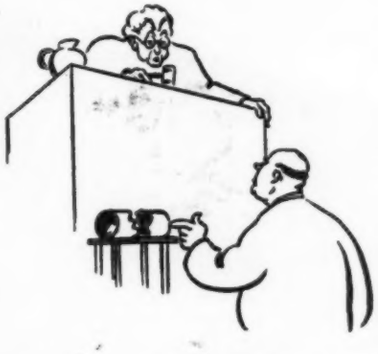
Obviously, here is a point of importance to machine part manufacturers, for a mistake, either in the selection of materials, design or fabrication, may easily result in a liability far beyond the price of the article involved. The application of this rule of liability is illustrated in an interesting and instructive manner in a recent case that arose under the following facts:

Manufacture of Pistons

Here the defendant, a machine shop, undertook to manufacture three new pistons for use in a 4-cylinder engine of well known make, which belonged to the plaintiff, a mill. The agreed price for the completed job was $384.50.

Now, when this contract was entered into, the representative of the mill expressed some doubt about the defendant being able to make these pistons. This was based on the fact that an agent of the engine's manufacturer had stated that pistons to fit this engine would have to be manufactured in a certain way or they would likely be a source of after trouble. The defendant's representative replied that his firm could manufacture pistons that would do the work and, with full knowledge of all the requirements, took the contract.

The pistons were delivered in due



time, properly installed, and paid for. However, when the plaintiff tried them out by starting the engine carrying no load they were found to be slightly too large. Plaintiff thereupon dressed them down ½-in. in a lathe. Following this, after two or three days' usage, the pistons swelled to such an extent that the engine stopped.

Plaintiff then tried further trimming by emery wheel and lathe, but the pistons continued to swell, sticking first in one place and then in another. This condition continued for two months, with the pistons giving more or less trouble, when they finally cracked and became useless. They were thereupon returned to defendant.

Following this the plaintiff submitted a claim for damages that totaled $962.50, resulting from this attempt to use the defective pistons. This claim was made up, among other things, of the cost of a new cylinder, $200, loss of two days' operation of plaintiff's mill, $300, and, of course, the original cost of the pistons, $384.50, along with a number of other small items. The defendant denied all liability and the instant lawsuit followed.

There was a mass of expert testimony from both sides. The defendant showed the pistons were manufactured in the usual way; that while no analysis of the materials used were made before casting, a later analysis showed the pistons to have been made of best gray iron. That after the castings had been made and the pistons roughed out, they were put through a seasoning process by being brought to a red heat and permitted to cool slowly.

Defendant then contended that the fault lay in plaintiff's installing, faulty lubrication or improper water cooling. Plaintiff replied by showing correct installation, proper lubrication, and an adequate water cooling system. Plaintiff then introduced evidence that tended to show that the pistons were "green"; that they were unseasoned, and being different from the material in the cylinder walls they swelled when in use.

On the foregoing record, the court in rendering judgment for the plaintiff reasoned, in part, as follows:

What the Court Said

"We might take all the testimony offered by plaintiff and defendant . . . and then be at an entire loss to account for the pistons sticking. However, we have an undisputed fact, which is that the pistons did stick and gave trouble from the beginning and were completely done for in about four months.

"The only way to account for the trouble is on the theory advanced by plaintiff, that the pistons were made of green material. And, although the method of seasoning used by defendant was the ordinary method, it was not sufficient in this particular instance . . .

"Defendant was put on its guard when the order was given for the pistons. It was incumbent on it to know that they were perfectly seasoned and would perform the work that they were manufactured to do, and, since defendant was the manufacturer of the pistons and responsible for them, it is liable for all damage caused to plaintiff by or through the defective pistons . . . Judgment in favor of plaintiff . . . in the sum of $959.50. . . . " (53 So. 340)

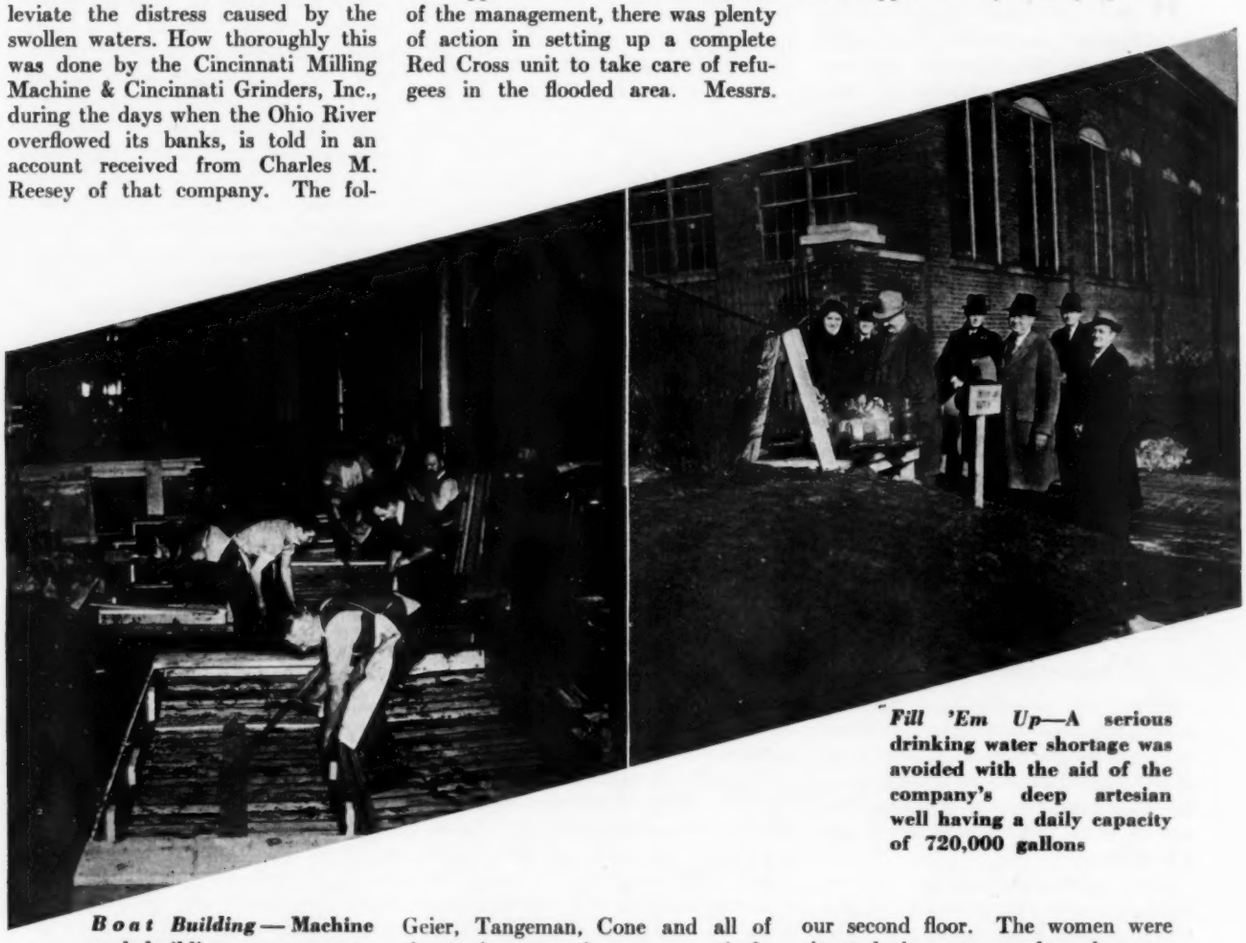
Machine Shop Samaritans

Among the many plant managements that literally rolled up their sleeves and took up the job of aiding the homeless, that of the Cincinnati Milling Machine & Cincinnati Grinders, Inc., stands out for its prompt and unselfish service

A PLANT in a flooded community has the problem of facing its own interruption to production and in addition must do its share to alleviate the distress caused by the swollen waters. How thoroughly this was done by the Cincinnati Milling Machine & Cincinnati Grinders, Inc., during the days when the Ohio River overflowed its banks, is told in an account received from Charles M. Reesey of that company. The following steps in connection with the establishment of Unit No. 8 of the American Red Cross in Cincinnati detail dramatically the public spirited work of this concern in caring for neighboring refugee families.

1. Sunday January 24, following the approval and recommendation of the management, there was plenty of action in setting up a complete Red Cross unit to take care of refugees in the flooded area. Messrs. Geier, Tangeman, Cone and all of the major executives were actively engaged in this organization work. Before eight o'clock on Sunday evening cots were assembled in our showroom, some of the machines had been taken out and such things as tables and desks were removed so that we could set up the beds. By nine or ten o'clock we already had a number of refugees and the following morning a group of 85 was brought out. Three days later we have approximately 200 people on our second floor. The women were situated in our regular show or demonstration room. The men occupied the area ordinarily occupied by our time-study and tool design departments. All of the equipment in this area was moved elsewhere, making room for the refugees.

2. The conference room on the second floor was used as a clothing



***Fill 'Em Up*—A serious drinking water shortage was avoided with the aid of the company's deep artesian well having a daily capacity of 720,000 gallons**

***Boat Building*— Machine tool building gave way to a boat line on which production rose with the river**

and storage room. The centerless demonstration department on the second floor was used for setting up a medical department and a library where the children could obtain books and games.

3. In the foremen's private washroom and conference room, we set up a barber shop so that we could do the necessary barbering work for the refugees.

4. In the new part of our plant adjacent to the shipping department we set up a complete power-operated laundry for washing all of the clothing for the refugees, and in addition, we were washing clothing for three hospitals. This laundry was completely set up by the American Laundry Machinery Company here in the city under the supervision of Mr. Dewey, their general sales manager. Monday night Mr. Hildenbrand talked to Mr. Dewey and the next morning the set-up was installed. Twelve hours later they were washing clothing. This consists of a complete laundry unit—washing, extracting and drying.

5. Sunday evening there was a eall for boats at the Red Cross Headquarters and immediately Dave Strauchen, superintendent of our plant, went to the Fisher Body Plant in Norwood which was making one of the first boats. He sketched up the boat and returned to our plant and immediately with Mr. Ewig, superintendent of the foundry, and Mr. Rengering, assistant superintendent, brought in the entire pattern force and proceeded to make boats. Twelve hours later they had completed 25 boats, and thereafter one came off the line every half hour. We made a total of 97 boats which were delivered by us to specific points of distribution designated by the Boat Division of the central Red Cross office. The pattern makers worked almost continuously.

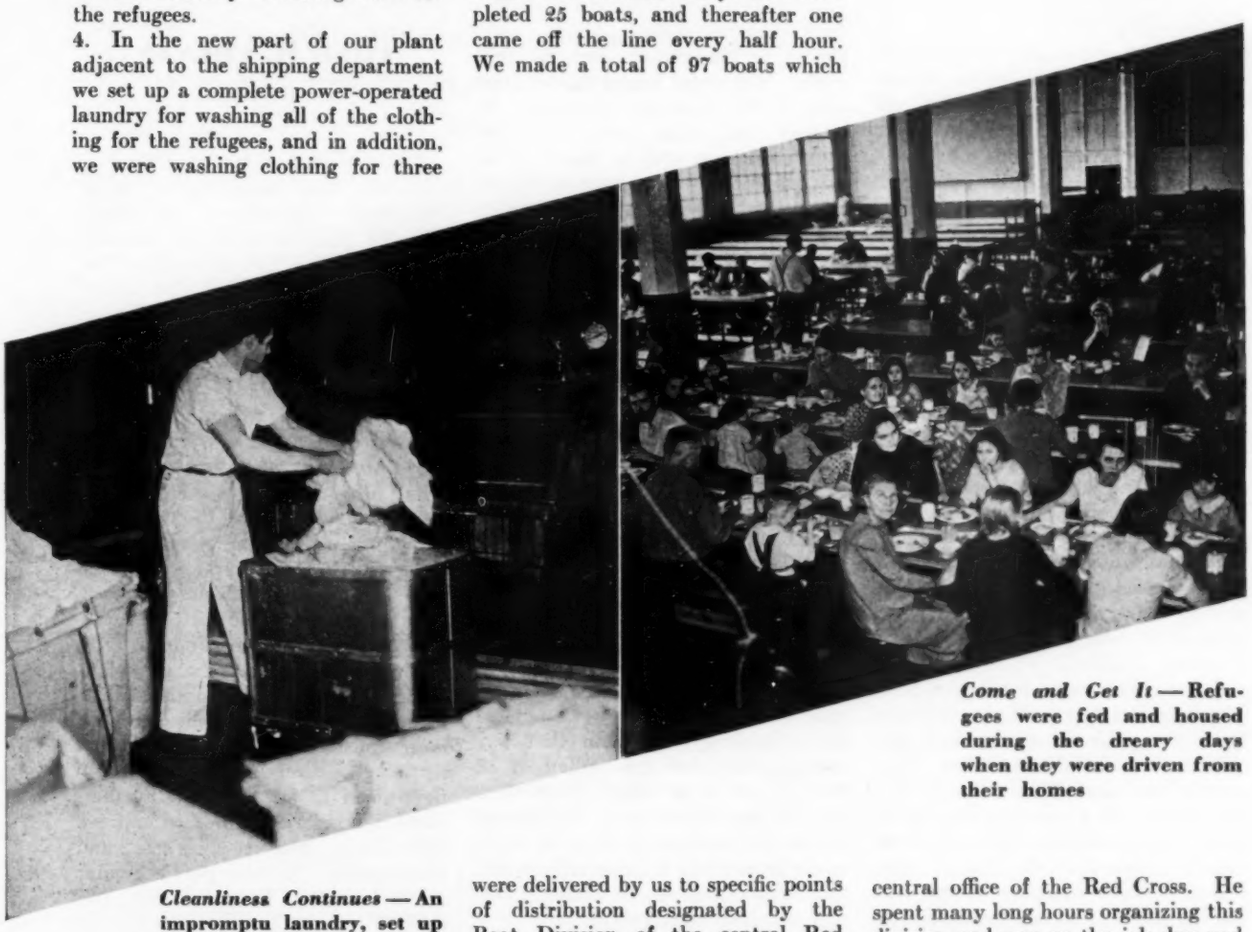
6. We are fortunate in having a number of artesian wells and we are actually pumping 650 gallons of water per minute. Special outlets were provided at three points on the outside of our building along Marburg Avenue, where people in the community and our own employees could obtain water. At the rear of our building, there was another outlet where we filled special tanks, bottles and other receptacles brought there by hospitals, hotels, etc. We made up ten large welded sheet-metal tanks holding approximately 500 gallons of water and placed them on our trucks and delivered water to the surrounding communities, hospitals and Hotel Alms. In addition, we supplied water to the City of Cincinnati by tapping in on one of the mains.

7. The whole purchasing department was occupied by the Operating Committee which was set up according to an organization chart.

8. In addition, Mr. F. V. Geier was one of the three chairmen of the Shelter and Housing Division of the central office of the Red Cross. He spent many long hours organizing this division and was on the job day and night, and sometimes late into the next morning. He was assisted by members of the executive staff and also the various departments. Many of these men are still carrying on the work of this division even though the flood has subsided.

9. Very few men were working in the shop during this time, but those in the order department, sales deparment, cost department and engineering department carried on as usual.

10. In the girl's washroom we had set up a bath tub, and in the main washroom on the third floor, we set up a shower for the men. This was for our office personnel. Schedules of baths had been worked out so that everyone that wanted to could take advantage of this opportunity to clean up.



***Come and Get It*—Refugees were fed and housed during the dreary days when they were driven from their homes**

***Cleanliness Continues*—An impromptu laundry, set up in the milling machine plant, maintained health and comfort in the absence of other facilities**

Can We Learn

From War Experience?

FRED H. COLVIN

Editor

TO ONE who recalls the shortage of skilled labor during the World War, many of the complaints of today have a familiar sound. Then, as always during periods of heavy demand, we were greatly interested in methods of training. Those who are now interested in obtaining skilled men, especially operators, will do well to study the many articles on this subject that appeared in *American Machinist* and elsewhere from 1916 to 1920. One writer told how, with expert supervision, he could train men to make drop forge dies in two months! It would be interesting to know if he still thinks so.

Norton had an eight-week course and kept 40 young men in the school so as to feed five a week into the production shop. These apprentices were trained in a separate shop having 6,000 sq. ft. of floor space, 33 machine tools and 130 ft. of work benches.

Other classes were for longer periods. One case was cited of a boy who made the grade of second class machinist in the Navy after four months' training. This probably was the result of a combination of a bright boy, excellent training and an urgent demand in the Navy. One feature of this training school was the keeping of a close record of each graduate for six months after he went into the shop.

Observations at that time indicated that the cost of the separate training schools is less than having the young men start in the shop. In too many cases the cost of shop training is not segregated but is buried in departmental expense.

The value of so treating these young men as to give them a good impression of the industry was pointed out at that time. Mutual respect and confidence has always played an important part in the problem of personnel and should never be lost sight of.

These young men were not trained as specialists or operators on one machine, but were given instructions in fundamentals that enabled them to become useful in various departments in a short time. Instructors played an important part in this work. Not only knowledge of the work to be done, but the ability to interest the young men, to secure their confidence and to handle difficult situations with tact, was all important in this work, and still is.

A feature that was emphasized at the time was the value of proper preparation, especially in paving the way to the different steps to come. This was done by connecting up the things the young man already knew with those that were ahead of him. Demonstrating the value, as well as the necessity, of the next step was said to add interest to the work and to aid in laying a better foundation for the student. Stress was also laid on the advantage of periodical tests that would show what had been learned and how it was understood.

Another example of high pressure instruction was practiced in the plant of the Savage Arms Company. Toolmakers were in great demand, and this company established a course for toolmaking instruction that was supposed to give the rudiments of this branch in 48 days. They went through five departments, the figures giving the number of days in each: small lathe work, 6; large lathe work, 6; milling machine, 12; shaping, 12, and grinding machine, 12.

A Good Background

The saving feature of this program was that only high grade machinists from the production department were taken into training school, so that it could hardly be called an apprentice course. With this background it was possible to upgrade good machinists into the toolmaking class by the short but intensive training outlined.

Much attention was given at that time to the upgrading of workers in all departments. This was done in various ways. Floor instructors, men with wide experience and especially tact, would show ways and means of doing work better and faster. Some emphasized the belief that the better way was also easier, and so avoided the antagonism aroused by the thought of driving.

Training courses for specialists, or operators, were frequently known as "vestibule" schools—a temporary stopping place between the employment office and the production line. It occasionally happened that urgent demand from the shop drew learners into production before they were sufficiently trained; or at least before they could stand the stress or constant urge of fellow workers, or the conveyor line. Workers who failed to keep the necessary standards, either of quantity or quality, were sent back to the vestibule school for further instructions or more experience. This practice, coupled with the floor instructors already mentioned, saved the jobs of many who might have been dropped.

This was not entirely a philanthropic move as it saved the investment in training and also gave a more constant supply of labor than as though entirely new people had to be trained to fill the gap. Furthermore, the practice tended to improve relationship between workers and management. Nothing puts a greater strain on shop harmony than frequent turnover, no matter what the cause. Anything which adds to security of employment tends to foster better feeling in the shop.

The costs of these vestibule training schools were given as varying from $25 to $100 per employee trained. This is a low figure as compared with the usually accepted costs of labor turnover, particularly where skilled men are considered.

One feature that was emphasized by several training school heads was the keeping of records of each worker. In one successful school each worker had a card which showed his progress in the school and after he went into the shop. These cards came up for examination every three months. They showed the progress as to ability and earnings. They also gave hints as to changes that might be made in the training methods to the advantage of all concerned.

Mathematics
for the Shop Man

II — Certain computations continually arise in making tool design and toolroom layouts

C. W. HINMAN

THE STUDY of mathematics stimulates the reasoning powers and is particularly useful to one who enters any of the mechanical vocations. The designer should prepare a quick reference card, showing all the numbered and lettered sizes of twist drills compared in diameters with Stubb's drill rod sizes; on the reverse side of the card, sheet metal gages, A.S.M.E. screw thread sizes, U. S. Standard threads, S.A.E. thread specifications and sizes of screw and bolt heads for round, square and hexagonal types. These can be clipped from catalogs and pasted on the card. A table of decimal fractions of an inch and millimeter conversions into decimal parts of an inch are also important.

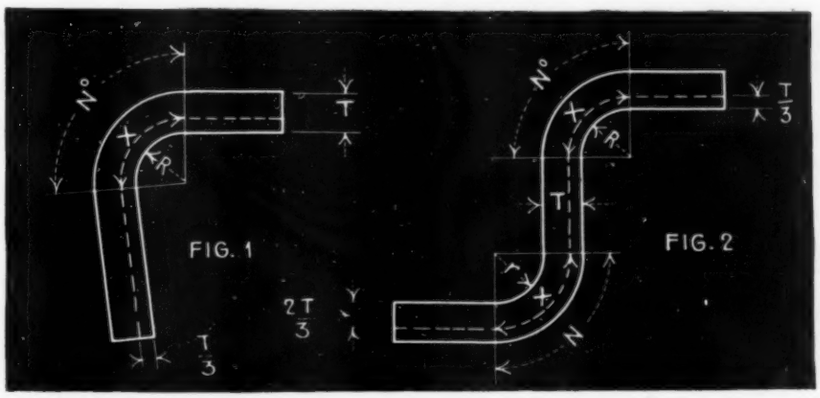
The designer should have Barlow's or similar tables of squares, cubes, square roots, cube roots, and reciprocals of numbers from unity to 10,000. Tables of seven place Brigg's or common logarithms of consecutive numbers from unity to 1,000 are also convenient. These tables include the logarithms of the natural trigonometrical functions of right triangles advancing by ten seconds of arc. If the designer is not familiar with the use of logarithms, it is easy to learn. The computations are simply the addition or subtraction of figures and finding the corresponding number in the table. One need not understand how logarithms are derived nor anything about their foundation on the theory of algebraic exponents in order to become an expert in using them.

It is not the object to duplicate here any of the mathematical data so ably presented in the *American Machinist's* and other handbooks. The object is to cite other practical applications for handbook mathematics and to add a few new formulas if possible.

The efficiency percentage of a machine is determined by dividing the power received from the machine by the original power applied. For example: If only 8 hp. is delivered by a machine which is driven by a motor delivering 10 hp., the resulting efficiency is 8/10, 0.80 or 80 per cent. This indicates a loss of 2 hp. by speed and friction. Obviously the output of this machine, in producing commercial returns from the sale of its product, must be high enough to offset at least the cost of operating a 10-hp. motor, plus wages and overhead costs, or else profits vanish. The power loss further indicates that for continued profitable performance, the most economical transmission of power is needed. Possibly an individual drive, the adoption of ball or roller bearings, or automatic lubrication; plenty of light and good machine designing are essential. It also indicates that initial costs of the new equipment should be ascertained and compared with the time required under the improved conditions to pay for them. Speed is a matter of ascertaining the maximum machine output commensurate with the loss of time occasioned by fast speeds, breakdowns and repair costs. This case is cited for the purpose of revealing the commercial importance of using simple arithmetic in only one of the many ramifications in modern manufacturing. It is a common case and one fraught with chances of financial loss if these calculations are neglected.

In computing costs for machining, there are many short-cut methods in use. For instance: The circumferential travel C, in ft. per min. for any diameter D, of a drill, milling cutter, pulley or lathe work is $C = 0.262 \times D \times$ r.p.m. The sheet metal pounds P, required for producing 1000 blanks in a press tool, allowing a five per cent loss for strip ends is: $P = A \times W \times 7.3$, in which A is the area required for one blank, W the weight of material per square foot and 7.3 a constant. To avoid the time and trouble occasioned in finding the weight per square foot of materials, prepare a constant or weight for each material 0.001 in. of thickness and multiply this constant by the number of thousandths in the desired thickness. For example: If sheet copper ⅛ in. thick weighs 5.79 lb. per sq. ft., $5.79/125 = 0.04632$ lb. is the weight per sq. ft. for sheet copper 0.001 in. thick. Therefore a square foot of No. 11 B & S gage (0.091 in.) sheet copper, weighs 0.04632×91 or 4.21 lb. Only one constant is needed for each material.

Many tabulated forms have been published for sheet-metal bends giving the circular arc lengths which must be added to the sum of the inside dimensions of the work to find development blank lengths. Two of



these tables, of exceptional value appeared in *Product Engineering*, December 1935 and January 1936. It is advisable, if interested, to clip such tables for reference. Paste them on cardboard and coat with white shellac.

The formula for the length of any arc bend, Fig. 1, follows. When T = material thickness, R = radius of bend, X = length of arc, and N = number of degrees in bend: $X = (T/3 + R) \times 0.01745 \times N$. For a 90-deg. bend direct, $X = (T/3 + R) \times 1.5708$. Since 1.5708 is practically 90 times 0.01745, the latter being the constant for a 1-deg. bend, these formulas indicate that the length of arc is directly proportional to the number of degrees in the bend. For double bends in opposite directions, Fig. 2, use $(T/3 + R)$ and $(2T/3 + R)$. When $R = 2T$ or more, use $T/2$. When R is less than $2T$, or has an inside sharp corner, use $T/3$. In computing lengths of blanks, the inside dimensions of the work should always be taken between the radii centers. The dotted line in Figs. 1 and 2 represents the neutral bending line.

Figs. 3 and 4 is a practical application, using both the given formulas. Fig. 3 is the work as usually dimensioned by the engineering office, while in Fig. 4 the same piece is redimensioned for using the formulas. Since the stock is ¼ in. thick (fairly heavy), both the given radii are necessarily large, and equal to or greater than twice the material thickness, hence $T/2$ is used.

0.01745 × 0.625 in. × 100	=	1.900 in.
1.5708 × 0.500 in.	=	0.7854 in.
3. × 0.500 in.	=	1.5000
Developed length	=	3.3754 in. or 3 3/8 in.

Those unacquainted with using mathematical formulas should understand that when quantities are written side by side, with no sign between, it indicates multiplication of the quantities, $R\ (A + B)$ means $R \times$ the sum of $A + B$. Quantities inclosed in parenthesis indicate that they must be used together. The radical sign $\surd$ indicates that the square root is to be taken of the quantity written under it, thus $\sqrt{16} = 4$. When a quantity is written 14^2 it indicates the square of 14 or that 14 is to be multiplied by itself.

Convenient formulas in designing, are those used for determining the heights of circular arcs, Fig. 5. Many uses can be found for these simple formulas.

$$H : B = B : X \qquad H = R\ (\text{versin } A^0)$$

$$\text{versin } A^0 = \frac{H}{R}$$

$$R = \frac{X + H}{2} \qquad R = \frac{H}{\text{versin } A^0}$$

$$R = \frac{B^2 + H^2}{2H}$$

$$B = \sqrt{2HR - H^2} \qquad \sin A^0 = \frac{B}{R}$$

$$H = R - \sqrt{R^2 - B^2}$$

The versed sine, or versin of an angle is unity minus the cosine.

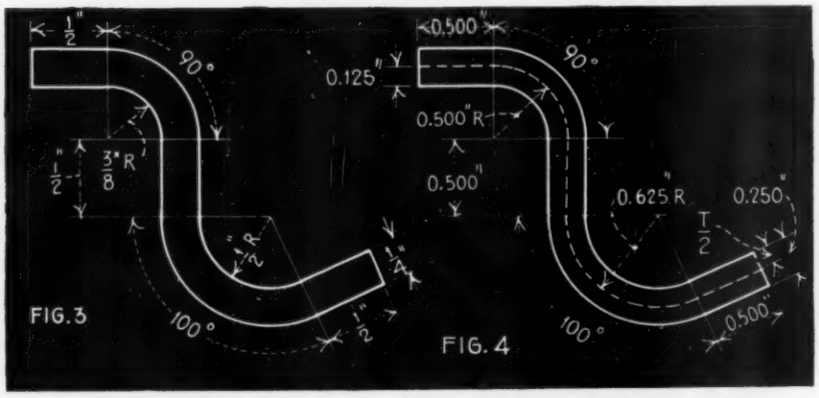


FIG. 3 FIG. 4

The first formula will give the diameter of a circle when its center is inaccessible. Draw any convenient chordal line, C—C, cutting the circumference at two places; then by the proportion, H is to B as B is to X, $X = B^2/H$, and $X + H$ is the required diameter. The chord C—C, and height H must be laid out as known dimensions.

Cutting off tools used in screw machines, automatic lathes, and various forming tools, must often be designed for "crowning" the ends of cylindrical work with a spherical sector as shown in Fig. 5. It then becomes necessary to use these formulas for the determination of tooling dimensions. These formulas are useful in computing the dimensions of press tool members for drawing shells having a semisphere, or less for a shell bottom. They are useful when designing spherical caps and covers, and in laying out dies for blanking circular armature sectors. As in figuring arc bends, the length of arc $L = 0.01745 \times R \times L^\circ$. There is a slight error in the constant 0.01745 however, and 0.0174533 is more accurate for precise calculations.

The accelerated movement of a press slide relative to its driving crank is an enigma to many. In designing a press feeding mechanism operated by cams attached on the crankshaft, it is necessary to know accurately how much this relative movement between the slide and crank really is and just where and when it occurs. In Fig. 6, if X represents the ram descent, T the "throw" or crank radius, and A° the angle of the crank advance from zero, then $X = T$ (versin A°) up to 90 deg., but after the crank has passed 90 deg. then $X = [\sin (A^\circ - 90^\circ)\ T] + T$. Suppose the crank has advanced 45 deg. from zero, and the "throw" is 2 in.; how much is the ram descent? The versed sine of 45 deg. is unity minus the cosine of 45 deg., or 1.00000 — 0.70711 = 0.29289, and 2 in. × 0.29289 = 0.58578 in., which

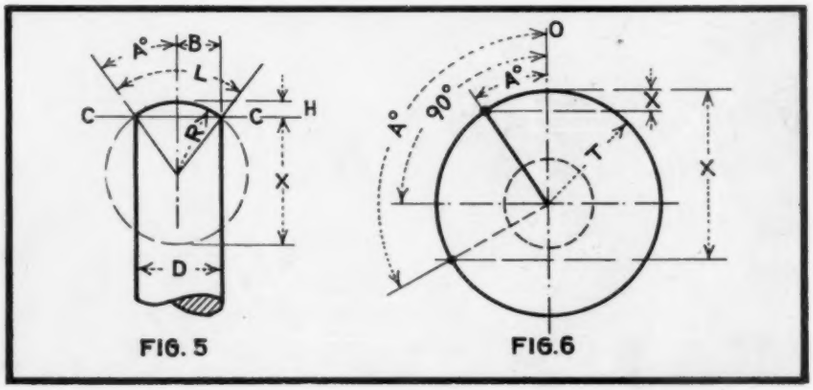


FIG. 5 FIG. 6

is the required ram descent. Assuming that A is 125 deg., the ram descent for the same "throw" is as follows: $X = [\sin (125° - 90°) T] + T$, or sin 35 deg., which is [1.57358 × 2] + 2 = 3.14716 in. A few handbooks get the versed sine directly.

For distances across the corners of squares, hexagons and octagons, Fig. 7: $A = 1.4142 \times B$; $B = A/1.4142$; $C = 1.1547 \times D$; $D = C/1.1547$; $F = 1.0824 \times E$; $E = F/1.0824$.

Figuring pulley or gear diameters to obtain a certain speed ratio, is a puzzle for most young shop men. First of all, keep clearly in mind which wheel is the driver and which one is to be driven, Fig. 8.

The diameter of driver × its r.p.m. = the diameter of driven × its r.p.m. A driving motor runs 1740 r.p.m. What pulley diameter is needed on the motor shaft to cause a press flywheel, which is 32 in. diameter, to revolve 125 r.p.m. when belted up? By the above formula, the required dia. × 1740 = 32 × 125 or the required dia. = 32 × 125/1740 = 2.300 in. Gear ratios are figured the same as belted pulleys, pitch diameters being used instead of pulley diameters. Another method is to count the number of teeth in the gears, then number of driving gear teeth × its r.p.m. = number driven gear teeth × its r.p.m.

In any triangle, when one of its angles is a right angle or 90 deg., Fig. 9, and when the length of its hypothenuse c is unity or 1, by dividing the length of any one side by the length of another side we get a quotient which is called a "Natural Trigonometrical Function." By this method all the given figures for the sines, cosines, tangents and other triginometrical functions in the handbooks have been computed and classified. The following formulas cover the solutions for practically all the right triangular problems arising in the average shop.

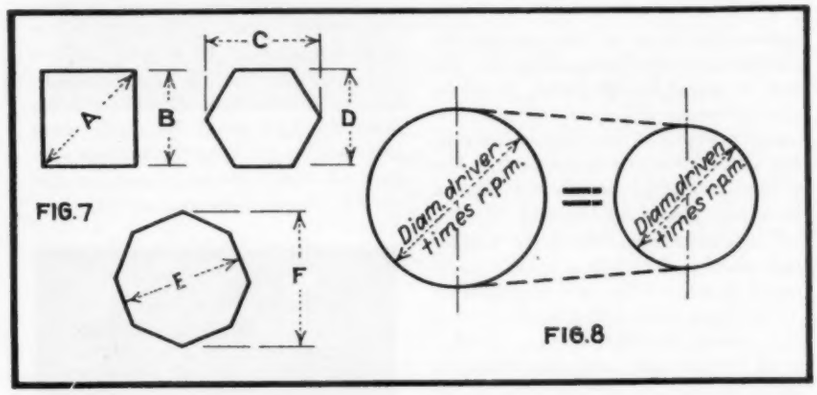


FIG. 7 FIG. 8

$\sin A = \frac{a}{c}$	$a = \sin A \times C$	$C = \frac{a}{\sin A'}$
$\cos A = \frac{b}{c}$	$b = \cos A \times C$	$C = \frac{b}{\cos A'}$
$\tan A = \frac{a}{b}$	$a = \tan A \times b$	$b = \frac{a}{\tan A'}$
$\cot A = \frac{b}{a}$	$b = \cot A \times a$	$a = \frac{b}{\cot A'}$
$\sec A = \frac{c}{b}$	$c = \sec A \times b$	$b = \frac{c}{\sec A'}$
$\csc A = \frac{c}{a}$	$c = \csc A \times a$	$a = \frac{c}{\csc A'}$

In any right triangle, Fig. 9, the sum of the angles A and B is always 90 deg. Therefore 90 deg. minus the number of degrees in either angle give the number of degrees in the other angle. Hence, if the length of one side and either of the two angles are given, all the remaining sides and angles can be found by using one or more of the foregoing formulas in connection with the handbook tables. If only two sides are given. then both the angles and the remaining unknown side can be similarly found.

If in Fig. 9, $b = 0.321$, and angle A is 32 deg. 12 min., and the length of side a is required, we naturally use a formula in which both a and b are involved, or $a = \tan A \times b$. Consulting the tables for tangents, tan A for 32 deg. 12 min. is 0.62973 and 0.62973 × 0.321 is 0.20214, which is the length of side a. $c = a/\sin A$ or 0.20214/0.53288 = 0.37934 which is the length of hypothenuse c. To check the work, since $c^2 = a^2 + b^2$ we have $c^2 = 0.14390$, $a^2 = 0.04086$, and $b^2 = 0.10304$, and the sum of $a^2 + b^2 = 0.14390$, coinciding exactly with $c^2 = 0.14390$ and proving the work correct. On the other hand if sides a and c had been given, and angle A was required, we would simply use the formula $\sin A = a/c$, and by dividing 0.20214 by 0.37934 we would have 0.532872 which is practically the sine for an angle of 32 deg. 12 min. If not proficient in this work, the student should draw the given triangle, put in the given dimensions and go over the work again. Then assume other triangles and dimensions and solve them. In solving a triangle *always* draw a clear free-hand sketch of the problem and supply all the given dimensions.

In Fig. 10 is shown any triangle in which the three sides a, b, and c are known, and the three angles, none of which are right angles, are unknown. The problem is to find the angles A, B and C. The usual formula for solving this problem is complicated by having to square each of the three sides, this is unnecessary as shown by the following formula: $\cos C = [(a + b - c)\ (a + b - c)/2ab] - 1$. If $a = 9$, $b = 10$, and $c = 8$, then $\cos C = [(27 \times 11)/180] - 1$ or 0.65000 which latter figure is the cosine for 49 deg. 27 min. 30 sec. or angle C. $\sin A = (a \times \sin C)/c$ and angle $B = 180$ deg. $- (A + C)$. The sum of the angles in any triangle is 180 deg.

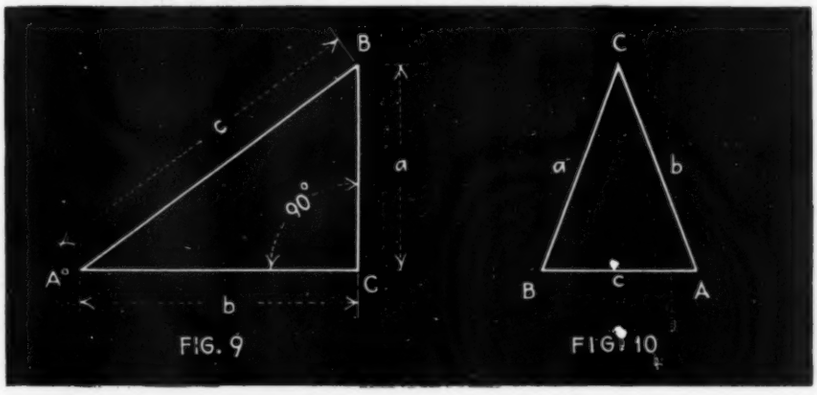


FIG. 9 FIG. 10

Part III of Mr. Hinman's series will appear in an early number.

Ideas from Practical Men

Press Tools for Corrugating Caps

GEO. WILSON

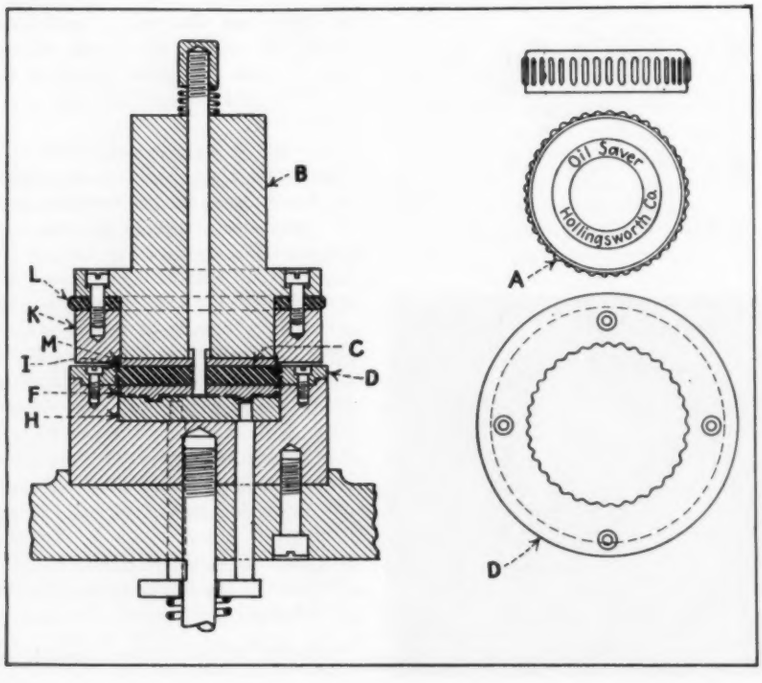
The press tools illustrated were designed for corrugating the rims of caps, one of which is shown at *A*, and to form raised rings to receive letters, the material being 0.036-in. soft steel.

The punch *B* carries the rubber disk *C*, about ½ in. thick. Section *D* of the die is the matrix ring for the corrugations in the cap rims. Expansion of the rubber disk by downward pressure of the punch forces the cap rims into the matrix ring to form the corrugations.

Plates *F* and *H* are attached to the rods of the upper and lower knockouts and form the raised rings for receiving the letters, which are formed in another operation. The beveled edge *I* on ring *K* is forced against the edges of the cap rims by compression and expansion of the rubber ring *L* as the punch descends, and prevents distortion of uncorrugated portions of the rims as the rubber disk *C* begins to expand. Another bevel at *M* permits the caps to be easily placed in the nest.

The matrix ring was made a separate piece to facilitate machining. As many holes as there are corrugations in the caps were drilled in a circle of the correct diameter, using a dividing head for indexing, and then boring it so as to cut to the centers of the holes. The rubber disk *C* and the rubber ring *L* were built up in layers from pieces cut from the inner tube of an old truck tire. The holes were burned with a hot rod and the outsides were ground in a lathe.

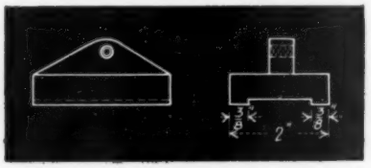
Corrugations are formed in the rim of the cap when forced into a matrix ring by a rubber disk



Scriber Block

ROBERT S. ALEXANDER

Most toolmakers will agree that the scriber block or small surface gage described by C. F. Fitz (*AM*—Vol. 80, page 933) is a useful addition to the toolkit. However, I believe the tool could be made more effective by relieving the bearing surface of the base as shown in the sketch, thereby eliminating the tendency to drag on the surface plate or on the machine table.



If the base of a scriber block or a surface gage is relieved as shown, dirt and small chips will not be so likely to get under it

We all know how easy it is for dirt and small chips to get under the base of a scriber block and disturb the even trend of a smooth, accurate line. So by minimizing the bearing surface and presenting a considerably smaller friction area, this handy tool would be much improved.

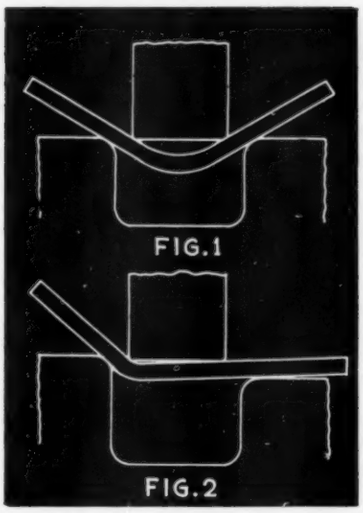
It would be quite simple for Mr. Fitz to relieve the hardened base of his own tool by grinding.

Modified Die for Forming U-Bolts

L. KASPER

In forming some heavy U-bolts in a punch press, difficulty was encountered in obtaining uniformity in the lengths of the legs. The forming die was of the conventional design, the forming section being approximately as shown in Fig. 1. It will be noted that the material has bent some distance ahead of the forming surfaces of the punch, causing it to slip on the forming corners.

We raised one corner of the die so that one bend would be partly formed



Non-uniformity in the lengths of the legs of U-bolts formed in a punch press was eliminated by raising one corner of the forming die

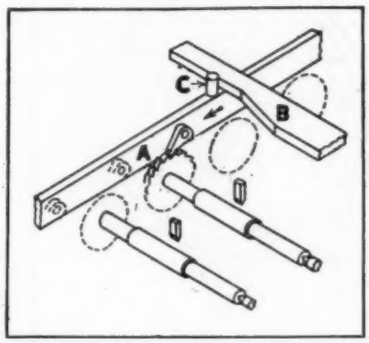
before the other bend was started, as shown in Fig. 2. It will be noted that the tendency of the material to bend ahead of the punch has been greatly reduced, and that so soon as one bend is partly formed, the material cannot slip in either direction.

Multiple Indexing and Planing

CHARLES F. HENRY

A repair shop in the South revealed a special sort of planer devised especially for grooving or serrating feed shafts for textile machinery. This machine handled ten shafts at once and was designed along the lines indicated by the diagram. On the driving end of each shaft is a notched disk or ratchet having the number of teeth desired in the roll. The work fixture, carrying the spindles on centers, was mounted on the planer table while the crossrail carried the tools properly located as to center distance.

The crossbar *A* spanned the fixture



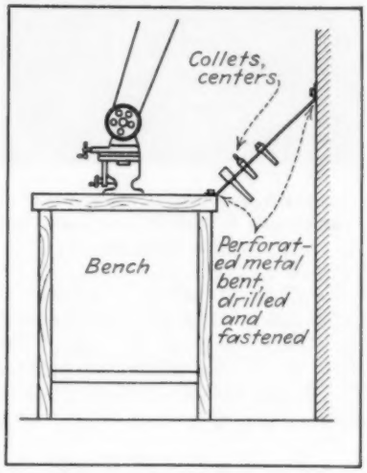
and carried a pawl for each ratchet. It was suitably guided so as to move across the table when the bar *B* with its cam or wedge contacts the roller *C*. Bar *B* is held firmly in place and does not move.

After the tools have completed their cut the pin *C* contacts the incline on *B* and is forced to the left, turning the ratchet one notch and indexing the work a like amount ready for the next cut. The pin *C* is held against the guide bar *B* by a spring. With these elements a fixture or a machine can be built to handle almost any similar work.

Handy Accessory Rack for Machines

BRUCE MacINTOSH

A piece of perforated metal, commonly used in machine shops for safety guards, cut and bent to the shape illustrated, makes a fine rack



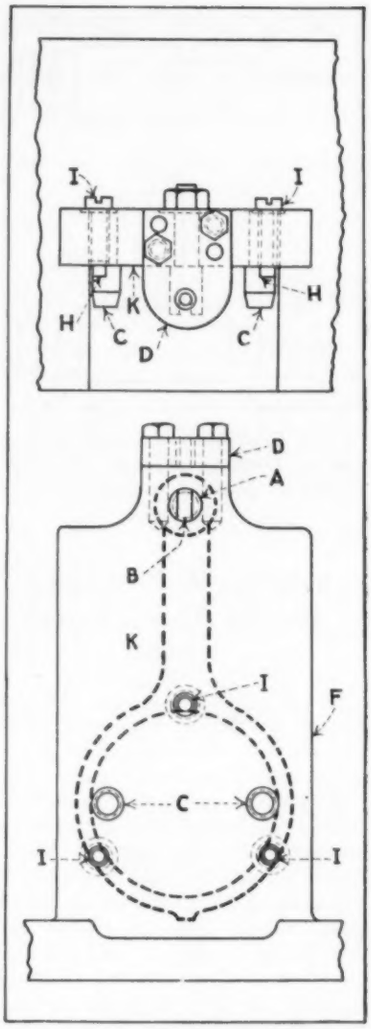
for holding small machine accessories such as centers, collets and burring studs. The rack mounting shown is typical of that of a toolroom precision lathe; it is screwed to the wall and bench at a 45 deg. angle.

Drill Jig for Oil Holes

CHARLES C. TOMNEY
Chief Tool Designer, Carrier Engineering Corporation

In the illustration is shown a jig for drilling oil holes in the piston-pin ends of eccentric straps for two sizes of compressors. The only difference in the dimensions of the straps is that of thickness, one being 13/16 and the other 1⅛ in. thick.

The piston-pin end of the strap is held on the stud *A*, which is a sliding fit in the hole and is slotted at *B* for chip clearance. The two studs *C* are

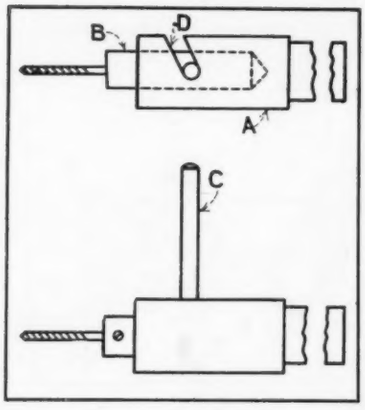


This jig can be adjusted for drilling oil holes in the piston-pin ends of eccentric straps of two thicknesses

spaced so that the bore for the eccentric spans them snugly, insuring that the strap will be vertical when stud *A* is in the piston-pin hole. The bushing plate *D* is attached to the top of the vertical member *F* of the jig.

As shown, the set-up is for drilling the 13/16-in. strap, the side of the eccentric end resting on the points *H* of the three screws *I*. When changing the set-up for drilling the 1⅛-in. strap, screws *I* are backed out until the points are below the surface *K*, permitting the side of the eccentric end of the strap to be in direct contact with that surface.

The back of the vertical member is spot faced so that when screws *I* are screwed in up to their heads their points will project the same distance *K*. In use, the eccentric strap is held in place in the jig by hand.



Lever C advances the drill by hand when breaking through the hole, avoiding breakage of small drills by the turret

Sensitive Drill Holder for the Turret Lathe

F. MUIR
Hamilton, Ontario, Canada

Not all turret slides are sensitive enough for drilling with small drills without risk of breaking them as the points come through the work.

To prevent such breakage and the consequent loss of time in resetting another drill, the sensitive holder illustrated was devised. The body *A* has a shank to fit one of the turret holes and is drilled to receive the drill holder *B*, which in turn is drilled for the lever *C* and for the shank of the drill. Lever *C* is driven into the holder and passes through the angular slot *D* in the body.

In operation, the body is set so that the turret slide is against its stop when the drill is just short of breaking through the work. Further advance of the drill is possible only by rotating the holder by lever *C* in the angular slot in the body. Since the lever is guided by the angular slot, the drill is prevented from jumping forward as the point comes through.

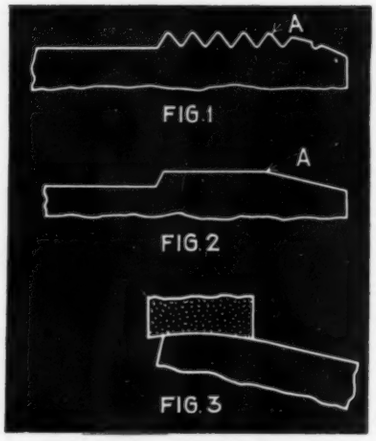
If the drill should catch in the work, the tendency is for it to rotate the holder backward and to pull the drill back, due to the lever being confined in the angular slot.

Care in Sharpening Taps

HECTOR J. CHAMBERLAND

While it is customary to sharpen taps free hand, the practice should be limited to sizes of ¾ in. and under. Taps larger than ¾ in. should be machine sharpened on centers and indexed to preserve the original spacing of the flutes. However, the most important part of the tap is the chamfer, and incorrect grinding of that part ruins too many taps.

The chamfer as ground by the maker is as shown in Fig. 1, not as in Fig. 2, which is generally the shape after being sharpened by the user. The strain on a tap in use is at the intersection of the chamfer with the straight part of the body, as at *A*. If the first two or three threads are given a chance to perform as they should, the remaining threads will take care of themselves.



Incorrect grinding of the chamfer is responsible for sending too many taps to the scrap pile

Sharp corners should be avoided at the intersection of the chamfer with the straight part of the body. The angle so formed should be blended by grinding the chamfer with a wheel having a slightly concaved face, as in Fig. 3. It then remains to relieve or back off the chamfer. This can be done free hand on the side of the wheel, using a hand motion similar to that in grinding drill points. The chamfer should first be given a light coat of prussian blue so that the operator can see where the wheel touches and avoid dulling the edges.

Automatic Dog for the Cylindrical Grinder

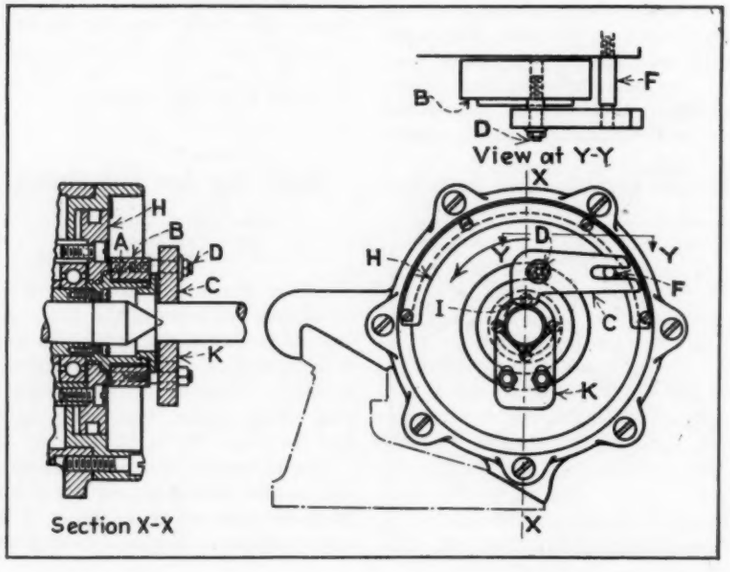
J. R. WHITTLES

In the illustration is shown an automatic dog for revolving the work in a cylindrical grinder having a headstock of the dead-center type. It saves the trouble of setting the dog each time he grinds a piece.

The collar *A* is attached to the stationary spindle and serves as a bearing on which the bushed collar *B* revolves. Collar *B* carries the L-shaped dog *C*, which is pivoted at *D*. The dog is driven by the pin *F* in the faceplate *H*, the pin engaging a slot in its tail. The faceplate is recessed to clear collar *B* and is driven from the countershaft by chain and sprocket, not shown.

As the faceplate revolves, pin *F* raises the tail of the dog and causes its cam shaped toe *I* to pinch the work and revolve it. The greater the resistance of the work to revolve, the harder the toe of the dog will pinch it. When the work is placed on the centers, the split V-block *K* is adjusted to bear against it and takes part of the clamping strain from the center.

The L-shaped dog C is raised by a pin in the faceplate, causing its toe to pinch the work and revolve it



Wright System Saves Tools

A comprehensive group of forms enables the master toolcrib to obtain and to issue special and perishable tools to the best advantage

H. R. LE GRAND
Assistant Editor

A TOOLCRIB can be a satisfactory adjunct to the production departments it serves, or it can be a pain in the neck. Which it is depends a lot on the intelligence and effort expended upon it. Of course, in larger plants a poor set-up will not be tolerated so readily as in a smaller one because the resultant snarls are much more deadly to output. Even so, a poorly run toolcrib is a constant source of expense and annoyance in any plant. Let us see how one concern has gone about getting a satisfactory system.

Back in the 1920's, the aircraft-engine business of the Wright Aeronautical Corporation became a mass-production proposition. New buildings had to be put up, new equipment installed and many more men hired. As the hum of production grew louder the demands on the toolcrib increased in volume.

What the System Does

The problem was too big, the investment in tools too large to permit haphazard methods. For these reasons, A. E. Luithle, production tool supervisor, visited a number of well-run plants over a number of years. Thus, through constant study and adaptation, he has developed a system that accounts for all tools, gets the tools into the hands of the men without delay, and keeps the inventory of perishable tools down to a one-month's supply. His organization includes a master toolcrib and eleven departmental toolcribs.

There is a good deal of paper work in the Wright system but it cannot be criticised lightly on that score. Reflection will show that if cumbersome, the system by this time would have fallen of its own weight; if insufficient the economies obtained would be lacking. Moreover, during the present high output of engines the toolcrib methods prove adequate.

Fundamentally, the set-up combines the features of the Kardex and the McCaskey systems. Kardex records are used in the master toolcrib to record stock of special tools on hand, with a supplementary Kardex file in each departmental toolcrib to record the activity of the special tools. Another Kardex file in the master crib gives the stock on hand and the activity of standard or perishable tools. McCaskey forms, in combination with brass workmen's checks, are used at the toolcrib windows for the actual withdrawal of tools and operation sheets. Various other forms also figure in the daily work of the master toolcrib to tie in its activities with those of other departments.

FORM 512

NOTIFICATION OF TOOL DELIVERY

TOOL NO. T-45149 Reamer
PART NO. 65297
OPER. NO. 65
HAS BEEN DELIVERED TO TOOL CRIB NO. 203
DATE: 11-9-36
REMARKS:

Fig. 1—When a department foreman receives this notification, he knows that a special tool wanted for a certain job has been received in his own toolcrib

Accurate, up-to-the-minute records are necessary to the master toolcrib because it is charged with all perishable tools. It in turn passes the charges along to the individual departments as tools are drawn out on requisition. Special tools are not charged to the master toolcrib but to the charge number set up for the particular model of engine on which they will be used. In this case, the toolcrib is responsible only for knowing where these tools are and for ordering replacements as required.

Special tools require more effort to secure than do perishable tools, and the master toolcrib plays its part in the process. There are two sources of supply—either an outside vendor, or the home toolroom. The choice is made at the discretion of the management, but at present the trend is to rely principally on the outside vendor because the Wright toolroom is kept busy in rebuilding jigs, fixtures and production machines.

Each model of engine has its own account number, to which special tools, jigs and fixtures are charged. In the tool design department there is a representative of the purchasing department, and when a tool is to be bought outside, this man prepares a purchase requisition in quadruplet. The original copy goes to the vendor, and of the remaining three one goes to the tool inspection, one to the master toolcrib, and one to file in the purchasing department.

Upon receipt of the special tool the receiving department checks it against the purchase order and six copies of a receiving report are made out and distributed as follows:

No. 1—To the master toolcrib as

notification that the tool has been received. The crib makes a notation on its copy of the purchase requisition that the tool has been received, with the date, so that inquiries from shop departments can be answered.

Nos. 2 and 3—These are sent with the material to tool inspection. When the tool is O.K.'d, the No. 2 copy is sent to the accounting department, while the No. 3 copy is held in the crib for reference.

Nos. 4 and 5—These are sent to the purchasing department.

No. 6—Sent to the accounting department.

The No. 1 copy of the receiving report goes directly to the master toolcrib, whereas the Nos. 2 and 3 copies accompany the material to the tool inspection department. The reason for this procedure is that the two departments are separated by two floors. After inspection, the accepted or rejected tools are forwarded to the master toolcrib with these two copies of the receiving report.

A Double Check

When the master crib receives the inspected tools, it checks the receiving order against the purchase requisition, as a double check, and to show that the material has actually arrived at its destination. If the quantity is short, the actual amount received is noted with the date on the purchase requisition. When the balance is received, it is also checked on the crib's copy of the purchase requisition. Then the No. 2 copy of the receiving report is O.K.'d and sent to the accounting department. Rejected material is noted on the receiving report, and is held until the sales order comes through to return it.

But if accepted, the procedure for setting up the records in the master toolcrib on the special tool is this:

1. A form, Fig. 1, is sent to the foreman of the department that will use the tool, to notify him that the tool has been delivered to his departmental toolcrib.

2. A master Kardex, Fig. 2, for file in the master crib is made out. This form shows stock on hand.

3. A Kardex, Fig. 3, is set up for the file in the departmental toolcrib and shows the tool-activity record.

The Kardex file maintained in the master toolcrib for special tools shows the following record for each tool: tool number, the purchase order number, the quantity bought, the vendor and the departmental toolcrib to which the tool is assigned. The second Kardex showing the tool activity in the departmental toolcrib gives the date when the tool is withdrawn and this date is checked off upon return of the tool. At inventory time a special stamp is placed below the record of withdrawals, and if two such stamps are applied without an intervening withdrawal, it means that there is apparently no further demand for the tool. In this case, the inactive tool is sent to storage.

After the activity of the special tool is discovered, desirable maximum and minimum quantities are set up on the Kardex in the master crib so that tools are available at all times for production. Moreover, the stock record on this master Kardex shows the number of replacement tools held in bins in the master crib. The columns for "Stock" show the number checked in, the number taken out by the departmental crib, and the balance on hand. When replacement tools are to be ordered, the file copy of the previous purchase order aids in determining where to order the tools and also the time that must be allotted before they will be received.

Replacements for special tools are ordered by the master toolcrib on the form shown in Fig. 4. A copy is held in file while the original and a follow-up card, Fig. 5, go to the production engineering department for checking against the latest design. When passed, the two forms go to the purchasing department which notes on the follow-up card when the tools were ordered and when due. A copy of the purchase order is sent back to the master crib for checking against the receiving report.

For Tools Made Inside

So much for special tools and replacements bought outside. Those that are made in the plant have different paper work. A "Departmental Order", Fig. 6, is prepared by the production engineering department. Space is provided for a sketch of the work to be done. The original copy is sent through to the toolroom foreman, while the carbon copy is held for file. If a blueprint is available, it is sent along with the original

TOOL NO. T-26446 — DESCRIPTION: Turn- — ing Fixture — BIN NO.

MAX. — MIN. — MODEL J-6 — PART NO. 63031 — PART NAME Counterweight-Rear

ORDERED				STOCK					STOCK				
DATE	P. O. NO.	QUAN.	VENDOR	DATE	CRIB	IN	OUT	BAL.	DATE	CRIB	IN	OUT	BAL.
			7/12/35		B7/442 Acme.	1							
				"	102		1	0					

Fig. 2—Stock on hand of a special tool is shown on this master-crib Kardex form. The handwritten notations give the purchase order number and vendor for convenience in re-ordering

T-26446 — DESCRIPTION: Turn- — ing Fixture — BIN NO.

MAX. — MIN. 63031

DATE	BAL.	TOOL ACTIVITY RECORD
7/12/35	1	54 8/11 ✓
		92 10/5 ✓
Dec. 30, 1935		
		54 3/4/36 ✓
		21 5/9/36 ✓
		08 7/10/36 ✓
		27 10/37

TOOL NO. T-26446 — DESCRIPTION: Turning Fixture — BIN NO.

Fig. 3—A second Kardex is maintained in the departmental toolcrib to give an activity record for the special tool

PRODUCTION ENGINEERING DEPT.

REQUEST FOR NEW TOOL OR ALTERATION

TOOL NAME: Finish Boring Bar — Dept. 203

REMARKS:

MAKE FOUR DETAIL #2 ONLY AS PER B/P.

Replacement - None on hand.

Wanted: 10/28/36

PART NAME: Cover-Super-charger-Rear

PART NOS.: 29935

TOOL NO. T-18903

MOD R-1820-F

OPER

DATE 10/7/36

REQUEST BY

APPROVED (FOREMAN)

APPROVED (SUPER.)

VENDOR | ESTIMATED COST

DES. BY DATE

DET. BY DATE

CKD. BY DATE

DESIGN COMPLETE

ORDERED

B FORM 287

VENDOR | SYMBOL: A. L.

PUR. ORD. NO.

B FORM 409 REV.

TOOL NO T-18903

TOOL NAME: Finish Boring Bar

PART NUMBER: 29935 | QUANTITY: 4, Det. #2

DATE REQUISITION | DATE FORMAL ORDER

TOOL ROOM HRS. | 201 DEPT HRS. | ..... DEPT. HRS.

VENDOR'S PROM SHIPPING DATE

DATE REC'D | QUANT. REC'D | O. K. INSP.

FOLLOW UP RECORD

1ST FOL.	1ST PROM
2ND FOL.	2ND PROM
3RD FOL.	3RD PROM.
4TH FOL.	4TH PROM

DATE WANTED: 10/28/36 | DATE REL. BY T. DES.

MODEL: R-1820-F | DATE REL. TO T. DESIGN: 10/7/36

Fig. 4—When the master toolcrib orders replacements of special tools, this form is sent to the production engineering department for checking against the latest design

Fig. 5—This card accompanies the request shown in Fig. 4, and is used by the purchasing department for follow-up

order. Furthermore, a time card is included, to give a means of checking the actual time against the estimated time. These data are used in future decisions of the management on whether to have special tools made outside or in the home toolroom.

When the special tool is finished, the work order and the print go with it to the tool inspection department. When the master crib gets the accepted tool, a notification of tool delivery is made out and sent to the foreman of the interested department, while the tool itself is sent to the issuing toolcrib. The work order then goes back to the production engineering file. A master Kardex and a departmental - toolcrib Kardex are made out for the tool the same as for tools bought outside.

A one-month's supply is the standard float of perishable tools maintained by the master toolcrib. When re-ordering, the follow-up man makes out a purchase requisition that is similar to the form used by the production engineering department in requesting new special tools. The only difference is that the standard perishable tool requisition is rubber-stamped as in Fig. 7, and filled in with the quantity on hand and the quantity used in the previous month. These data are determined from a separate Kardex file maintained solely on perishable tools. This Kardex differs from that in Fig. 2 only in that space is provided to enter the unit price.

In figuring the new quantity to be ordered, the follow-up man gives consideration to the number of engines to be built in the coming month as against those during the preceding month, when, of course, the tool usage was known. He also enters a "standard" balance on the Kardex to aid in maintaining a sufficient supply of tools. This standard balance is calculated from the length of time for delivery. Such items as grinding wheels may take from four to ten weeks after receipt of order, whereas emery cloth, taps and standard drills can be delivered at a week's notice.

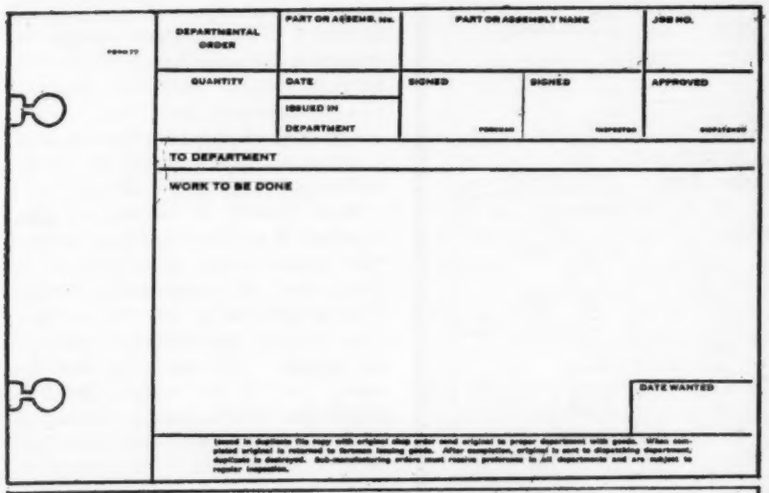
More leeway is allowed in the standard float when ordering perishable special tools. For example, a twist drill of non-standard length will be ordered in say 2-doz. lots, even though the usage is only six per month. The reason is that the set-up cost in the vendor's plant is distributed over a greater number of tools and therefore the unit price per tool is much lower. Very rarely is the master crib caught with tools that cannot be used.

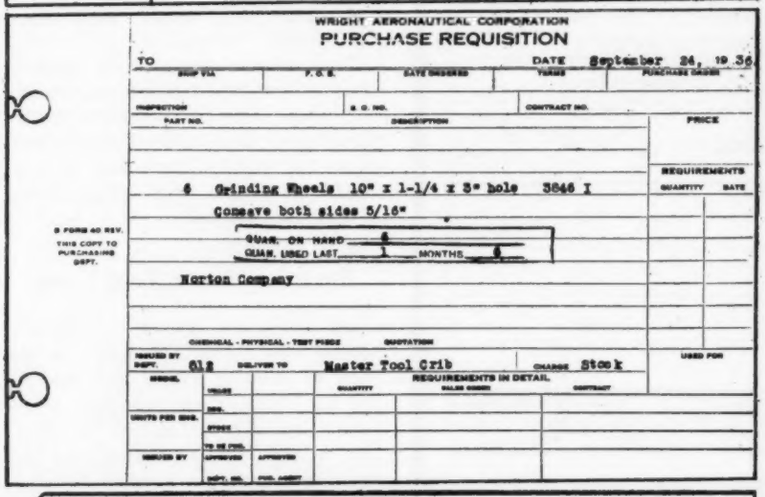
The purchase requisition is checked over by the purchasing department, and then bids are taken. Usually there is a first, second and third choice of vendor, according to the shop's experience with the products of the various makers.

Foremen Know Tool Costs

All tools are drawn by departmental crib attendants, and supplies such as grinding wheels, are ordered by the department foreman on a requisition, Fig. 8, that lists the quantity ordered, the department and the work order number to which the material is to be charged. The date of withdrawal is put on the master crib Kardex which shows stock activity. Other entries made on the Kardex are the department that got the material and the quantity. Since the unit price of the material has already been recorded on the Kardex, it is a simple matter to enter this unit price on the raw-material requisition, which is then sent to the accounting department. Once a week the total cost of perishable tools drawn by each department is calculated and a copy is given to the foreman interested. This report sets up the budget figures for each department and the actual tool costs of the week in question, and the three previous weeks for purposes of comparison. It also gives an itemized list for each department of all tools drawn, the unit cost, and the total cost. This practice has had a big influence on bringing down tool consumption because it compelled the foremen to analyze the reasons.

Up to this point, the discussion of methods at the Wright master toolcrib has centered upon getting special and standard tools in and keeping





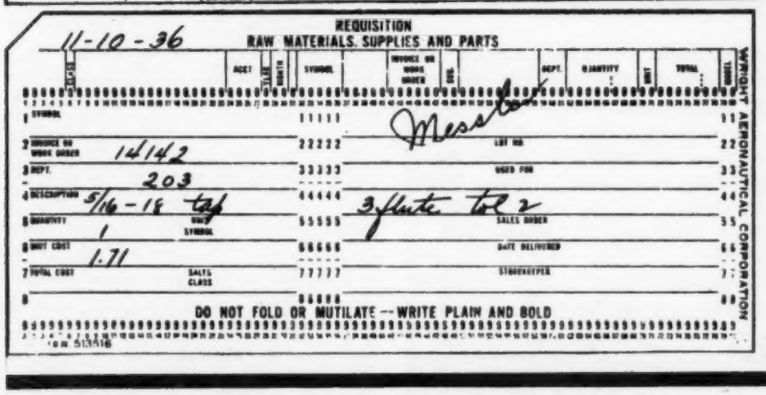


Fig. 6—When special tools are to be made in the Wright toolroom, a "Departmental Order" is made out instead of a purchase order

Fig. 7—Purchase requisitions for perishable tools are rubber stamped as shown at the center. The previous month's usage, as obtained from a Kardex activity and stock record, governs the quantity ordered

Fig. 8—Perishable tools are drawn by department foreman on this requisition form. Each week the total value drawn out and the budget figure are reported to him

track of them and their activity. The method of issue to the men is also of interest because, although apparently involved, in reality it expedites the physical handling of the tools and their check up.

When assigning a job, the foreman gives the operator a routing card for the work. This card bears the part number, the order number, and lists all the operations to be done. Those that have already been performed are punched out, so that the operator knows immediately which one he is to do. He goes to the toolcrib and makes out one order, Fig. 9, for an operation sheet giving him full instructions, and another order, Fig. 10, for tools. These orders follow the McCaskey system. Brass checks are deposited against each tool order.

The "Operation Sheet Order" is made out in triplicate, and marked "BP" if a blueprint is wanted. The original copy of the operation sheet order is retained by the operator, and the other two are passed over to the toolcrib attendant. The second copy is put into an envelope with the operator's number on it, a file of such envelopes being maintained. The third copy of the order is placed in an operation folder which is filed according to the part number. With this system it is always possible to find out who has a particular operation sheet.

Toolcrib System

Upon the operation sheet is a list of the tools required to perform the work. Each tool is numbered. The operator lists the tools on a "Tool Order" which is also made out in triplicate. Again the operator retains the original, while the two copies are filed with one of his brass checks. This file is also set up according to the number of the operator. An entry is made on the Kardex file to show the date of tool withdrawal, and the operator's number. An advantage of the Kardex file is that it gives a record of all operators who have had the tool previously. Suppose that an intricate fixture has a detail missing. By reference to the Kardex it is possible in many cases to locate the missing detail among the men who have had the fixture out.

When the tool is returned, the operator passes in his copy of the tool order, and the second and third copies, together with his brass check, are picked out from the file. The check and the second copy are given to him as a clearance, and the transaction is complete. The Kardex file entry is checked off at the convenience of the attendant. Likewise, when the operation sheet is returned, the slips are cleared out of the file. All micrometers and measuring instruments are given a serial number and maintained in the toolcrib on a separate Kardex.

Brass checks might not be required, but occasionally a workman must go from his toolcrib to one in an outside department in order to get the tools wanted. For such cases, each

Wright Aeronautical Corp.

OPERATION SHEET ORDER
BLUE PRINT ORDER

№ 27705

Clock No. 102-27 Date 10/27/36

Part No. 62596 Oper. No. 305

NOTICE TO WORKMAN

The above item is in your care until it is returned. If lost it will be charged to you. Keep this slip until operation sheet or blue print is returned, then exchange it for your receipted slip.

Signed Geo. Lasky

THIS ORDER IS FOR ONE ITEM ONLY

FORM NO. 312

WRIGHT AERO CORP. FORM 379-SSH-5-36

TOOL ORDER

Clock No. 102-27

Date 10-27-36

WORKMAN NOTE. - These tools are in your charge until they are returned. If lost they will be charged to you. Keep this slip until tools are turned in. Then exchange it for receipted slip.

Signed Geo. Lasky

QUAN.	TOOL NUMBER	RETURNED
1	Timing Fix T-26446	M-9
1	Profile Plate T-40000	A-11
1	End Mill 26575-T-1	H-111

Fig. 9—When starting a job, the operator makes out this McCaskey slip to secure an operation sheet and blueprint

Fig. 10—A list of tools required is given on the operation sheet and is ordered from the attendant with this slip

toolcrib maintains a small "foreign file." Also, each man receives ten checks when hired, which must be accounted for when he leaves the company's employ. If he does not have all ten checks, he must go around to all toolcribs and get a release from each. When all checks are accounted for, the operator's payoff slip is signed by his toolcrib attendant and countersigned by the master crib.

Once a week all broken or worn tools are turned in by each department to the master toolcrib. Accompanying these is a "Broken or Worn Out Tool" slip. If anything can be salvaged it is stored on suitable racks subject to call. There are large supplies of undersize plug gages, reamers, form tools, cutters, short drills and similar tools. The salvage department also gains when a manufacturing department no longer has use for certain tools because the nature of its operations have been changed. The unwanted tools are sent to the central salvage, but no credit is given to the department that returns them. Frequently, an undersize tool is desired and can be quickly located on the racks. In addition, plug gages are sorted out according to size, and when a sufficient number has been accumulated they are sent out for chromium plating back to size or worked to new size.

Mounted diamonds for wheel dressers are issued directly by the master crib on the usual tool order. When the diamond becomes unserviceable or broken it is turned back to the master crib with a "Broken or Worn Out Tool" slip signed by the department foreman. A new diamond will then be given out on the same order. The broken or worn out diamond is reset and the loss in weight is charged against the workman's department. The charge is computed from the original cost of the tool.

Because of the value of such tools, the operator can turn in diamonds each night to his departmental tool crib, since the brass check and a copy of the tool order have been forwarded to his crib for this purpose by the master crib. He gets the check back, but leaves the tool order in, so that no one else can get the diamond charged against him.

Again, it will be said that there is necessity in the Wright plant for the high degree of control and paper work described. That it works smoothly can be attested by personal observation. The operators get their requirements practically immediately, there is no clutter of tools awaiting return to the racks, and the toolcrib forces are not equipped with roller skates.

Skill—What Is It Worth?

A. W. FORBES
Forbes & Myers

HOMER E. COY tells of the difficulties that fellow apprentice graduates have had (*AM*—Vol. 80, page 509). There were difficulties that would cause any intelligent boy to think more than once before taking such a course. There was lower pay than that of production workers; there was greater irregularity of work; and there was the failure even to be able to hold a job in the same trade in other plants. So why should a boy spend the years of preparation?

Business conditions were responsible only in part. Such experiences—bad for graduates—are even worse for the younger boys who contemplate apprenticeship. The graduates tell their troubles to other boys and to the boys' parents, and the tendency is to condemn all apprenticeship because of these failures. The younger boys are refusing real opportunities as a result.

It is true that trade-school graduates have had similar experiences during these last few years. But the schools graduate knows that he must seek work elsewhere. If he fails to get it, he is more likely to blame the employers than the school. With apprenticeship it is different. If the apprentice completed his course satisfactorily, he was the kind of boy that the employer wanted to train. He then would have every reason to demand suitable work at more than the average wage, so long as the work was available for others in the plant.

I do not know what was wrong with this particular program, having no facts except those given by Mr. Coy. It is clear, however, that something was seriously wrong. It is also clear that the employer had no moral right to ask the boys to take a course of apprenticeship that had such a conclusion. But what can we do about is? How can those who advise boys warn them against such a course? How can those of us who are offering programs of superior quality convince the boys or their parents that the result will not be the same as that Mr. Coy tells about?

Shop Equipment News

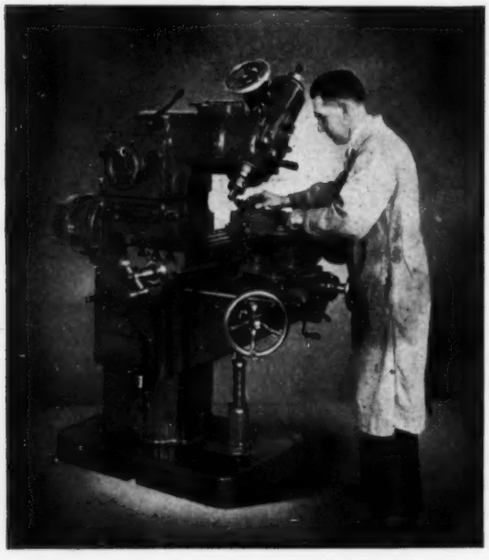
Brown & Sharpe No. 2 Vertical Milling Machine

The No. 2 vertical-spindle milling machine, recently announced by Brown & Sharpe Mfg. Co., Providence, R. I., features a swiveling spindle head and a uniformly deep throat throughout the entire vertical travel. Spindle speeds range from 55 to 800 r.p.m. making the machine adaptable to various end-milling and drilling jobs requiring small cutters with relatively high speeds. Spindle head can be set to any angle up to 90 deg. each side of vertical, in a plane parallel to the table.

To facilitate set-ups when the head is swiveled and to permit drilling at any setting, the spindle is provided with an axial hand movement of 3 in. in all positions. This also makes possible step-milling without changing position of the knee. Spindle can be clamped anywhere in its axial movement by a lever at the lower front of the head. An adjustable dial at the top of the head permits adjustment of the spindle position to 0.001 in.

Two hardened steel stops at the front of the spindle head are attached to the spindle slide and to the head respectively and are accurately ground on their facing surfaces. These stops enable the use of measuring blocks for high-precision set-ups for depth of cut.

There are sixteen changes of longitudinal, transverse and vertical power feed ranging from ½ to 18¼ in. per min. These feed changes are independent of the spindle speeds. The machine is gear-driven from a constant-speed, flange-type 3-hp. motor mounted at the rear. The starting lever is easily reached from the front of the machine and the same lever operates a mechanical brake for quick stopping. All driving mechanisms are automatically lubricated.



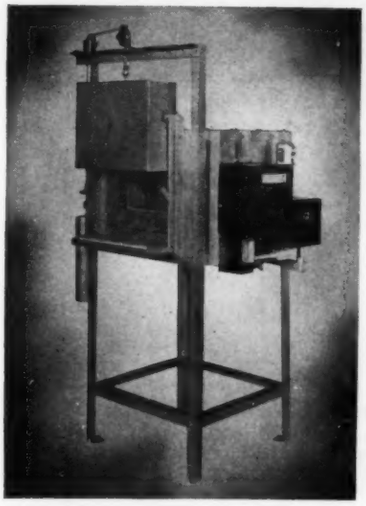
The following ranges of automatic power feed are provided: longitudinal, 28 in.; transverse, 10 in.; vertical feed of knee, 15 in. Dials permit manual adjustments to 0.001 in. Design of the column affords a throat distance of 12 in. throughout the entire length of vertical travel. With spindle vertical, the greatest distance from end of spindle to top of table is 18 in. When spindle is horizontal, the greatest distance from center of spindle to top of table is 24½ in.

Miller Arc-Welder

"Miller Standard Arc" welders, announced by the Miller Electric Mfg. Company, Inc., Appleton, Wis., are available in four models, with capacities from 130 to 300 amp. These light-weight transformer-type welders supplement the line of portable arc welders manufactured by this company. They are designed without reactance control or sheet-metal attachment and have the same efficiency as the regular welders. Each is equipped with a rotary knife switch control with the amperage clearly marked for each welding step. These units can be used for welding on grounded surfaces.

"Falcon" Electric Muffle Furnace

The "Falcon" high-temperature electric muffle furnaces, offered by H. O. Swoboda, Inc., 4301–3 Main St., Pittsburgh, Pa., are suitable for operating temperatures up to 2,300 F. They are equipped with high temperature metallic heating elements mounted in the hearth, roof, side walls and rear of the furnace. Elements are of the wound type and are substantially supported in grooved refractories. Refractories are reversible for forming muffle chambers,



or separate muffles can be supplied.

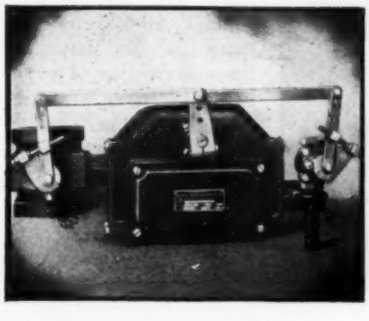
Inside dimensions of the 6-kw. furnace shown are 9 in. wide, 6 in. high and 13 in. deep. The entire chamber, together with insulation, is inclosed in a sheet metal casing. A steel frame door, together with a refractory charging shelf, is provided on the furnace. Furnaces are available in various chamber sizes and capacities as well as for 110, 220 or 400 volt service. While the equipment illustrated is floor mounted, it can be supplied for bench mounting.

ATC "Balancer" for Valve Movements

The ATC "Balancer," offered by the Automatic Temperature Control Co., 34 East Logan St., Philadelphia, Pa., is an electrically-operated control mechanism designed to regulate the fluctuations of such variables as temperature and pressure by the movement of valves or other correcting devices in amounts exactly proportional to the deviation of the variable from desired normal. Where load changes are of such a nature that a prolonged change in valve position is required, the balancer automatically and promptly compensates for requirements of the new loading.

This instrument is an improvement over the "Relatrol" which gives a fixed valve opening at a given temperature. The "Balancer" has the same motor mechanism as the "Relatrol," the difference between the two systems being in the construction of the relay and the design of the operating circuit.

The "Balancer" is particularly adaptable to furnaces and other heating units having intermittent or irregular loading schedules.

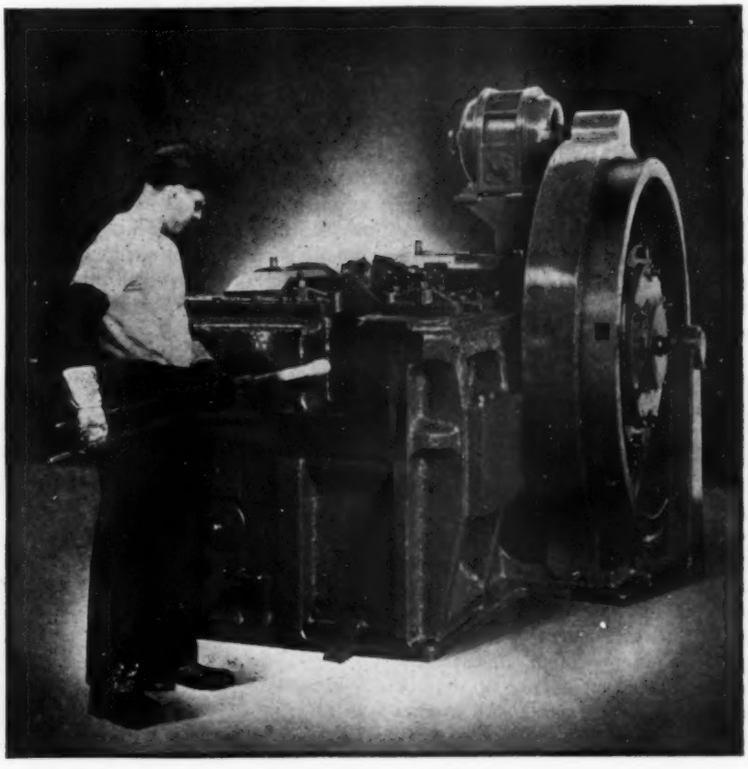


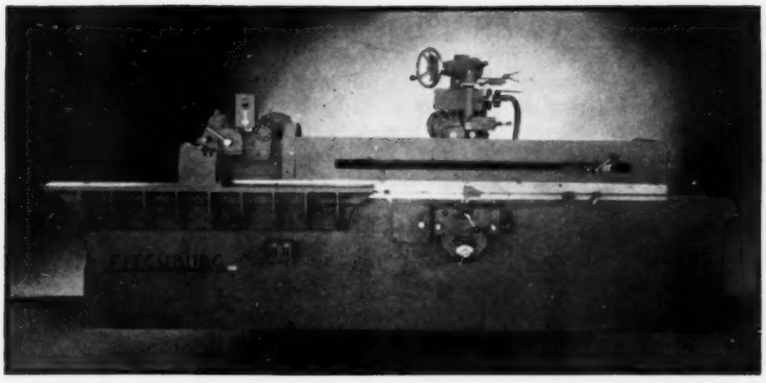
Ajax Bolt Heading and Forging Machines

Bolt heading and upsetting forging machines announced by the Ajax Mfg. Co., Cleveland, Ohio, are available in two sizes, rated at 1 in and 1½ in. capacity. These models embody a completely new design and are equipped with the Ajax air clutch which has proved successful on larger size machines. They occupy less floor space than earlier models and give higher production on a wide variety of upset forgings. The bed frame is a one-piece, open-hearth steel casting with heavy ribbing to withstand the heading and gripping pressures. Integral bearing housings, bridged with a crown rib, provide rigid support for the forged alloy crankshaft which rotates in solid sleeve-type bearings. The header slide, which is top suspended, is held in alignment by an extension guide bearing. Design is such that the entire pitman assembly is accessible for inspection or adjustment.

Toolholders are held in definite relationship to the slide and are easily aligned without making complicated adjustments. They are carried within a slot-type pocket with no overhanging weight beyond the slide support bearings. The moving die is supported between bearings which maintain its face square with that of the stationary die insuring accurate, uniform forgings. Die grip is actuated from an eccentric pin on the end of the crankshaft, which permits high-speed operation. Large-diameter toggle pins are supported so as to be placed in quadruple shear.

A fully automatic safety mechanism protects the machine from damage due to oversize or misplaced stock which would prevent the dies from closing. It immediately resets itself so that production is not interrupted by a shut-down which would necessitate removing the heated stock from the furnace.





Fitchburg 60-In. Spline Grinder

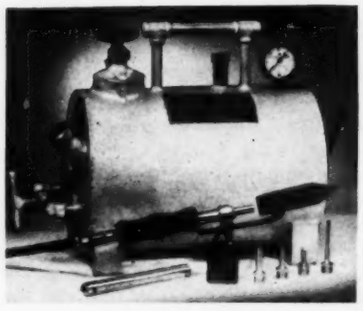
This spline-shaft grinder, manufactured by the Fitchburg Grinding Machine Corporation, Fitchburg, Mass., will take 60-in. between centers when equipped with the table-type truing device and 72-in. between centers when the truing device is mounted on the wheel head. Otherwise the specifications are the same as for other spline grinders.

The table-type "W"-form truing device is adjustable for diamond height so that the "W" form of the wheel will coincide with the finished size of the splines after grinding. This device is not as universal as the wheel-head type, in that it cannot be adjusted for such a wide range of shaft and spline sizes. It is more suitable for production work and is a faster operating mechanism as there are three diamonds, which operate on eccentric rods.

"Ace" Soldering and Brazing Unit

The "Ace" soldering and brazing unit, manufactured by Reiner & Campbell, Inc., 242 Lafayette St., New York, N. Y., is a portable acetylene gas generator equipped with suitable torch and blow pipe tools for soldering, brazing, melting and heating purposes. The generator produces gas without pumping or preheating, and can be recharged with carbide while in operation. One filling of carbide will last for four to five hours when using a small soldering tip. One charge of water is sufficient for three charges of carbide.

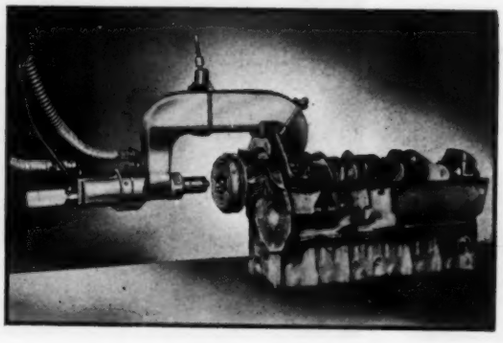
Gas is developed immediately in the automatic generator and heat regulation is provided so that the temperature of the copper tip may be held at any heat desired. All torches are equipped with needle valve regulation. The unit is 10 in. high and 13 in. long and consists of the generator, torch and iron, blow pipe with four tips, hose, lighter and carbide. There is no smoke, dust, dirt or sparks, and the unit is windproof.



Hannifin "Hy-Power" Portable Press

The Hannifin Mfg. Co., 621 South Kolmar Ave., Chicago, Ill., has developed a high-speed, portable, yoke-type hydraulic press for the application of timing gears and harmonic balancer units on automobile engine crankshafts. The press is fitted with a locating fixture which simplifies handling and alignment with the work. Starting the parts squarely on the shaft is assured. Hydraulic pressure is provided by a "Hy-Power" hydraulic pressure generator, which is a self-contained pump and intensifier unit driven by a 2-hp. motor. High-pressure hose and a control cable connect the generator and the press.

The operating cycle is completed automatically upon pressing the control button, which actuates the automatic electric valve unit. A complete operating cycle requires approximately two seconds. The press weighs about 80 lb.



Yale Dumping Scoop Truck

This Yale dumping-shovel scoop truck has been developed by the Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa., for handling bulk materials. It is capable of shoveling into a pile of sand, coal, small castings and other miscellaneous loose materials, picking up 10 to 15 cu. ft. at one load for transportation to a desired destination. The load can be elevated and dumped at any height within the range of the lift mechanism. Design of this unit is such that it will maneuver in close quarters. For example, it will scoop materials from inside a freight car.

Westinghouse Seam Welder Control

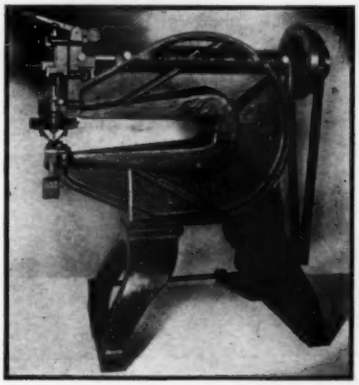
A seam welder control utilizing ignitron tubes is offered by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This control times power impulses, in terms of a definite number of power cycles, to a wheel-type electrode resistance welding machine. Among its features is an inductive timer, consisting of a synchronous-driven disk rotating once per second and containing 120 holes, each corresponding to a half cycle of welding current.

The use of ignitron tubes permits a design

utilizing no voltages higher than line voltages and eliminates the need of power contractors and transformers. Steel pins are plugged into the holes according to the timing desired. Use of this control improves the quality of welds for even very light gage steels. It is especially suitable for welding heavy gage steels, demanding heavy welding current. Special metal alloys demanding accurate timing and often heavy current, such as aluminum and "Olympic" bronze, can also be welded.

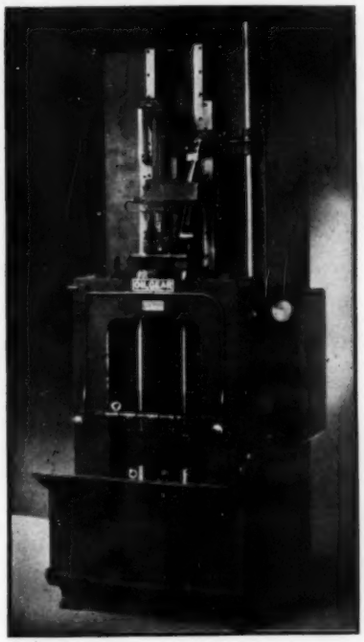
Gray No. 4 Metal Cutter

The No. 4 turret-head metal cutter, manufactured by Gray Machine Co., Box 596, Philadelphia, Pa., has a 36-in. throat and 3/8 in. capacity in mild steel. Capacity in hard, tough alloys is 3/16-in. sheet. A two-speed floating-power drive is arranged to



keep the belt tight at all times and to eliminate drive vibration. The base has been redesigned for increased rigidity and it now covers about four times as much floor area as formerly. This makes possible mounting these machines on light floors without setting up undesirable vibration.

Two operating speeds are provided. When cutting maximum capacity stock in mild steel, or lighter gage materials in tough alloys, the machine is operated at 450 r.p.m. The high speed of 900 r.p.m. is used when cutting light gage mild steel stock. Interchangeable eccentrics, ranging from 1/16 to 5/8 in., can be used. Floor space occupied is 30x42 in., and shipping weight is 3,900 lb.



Oilgear Type XM-30 Broaching Machine

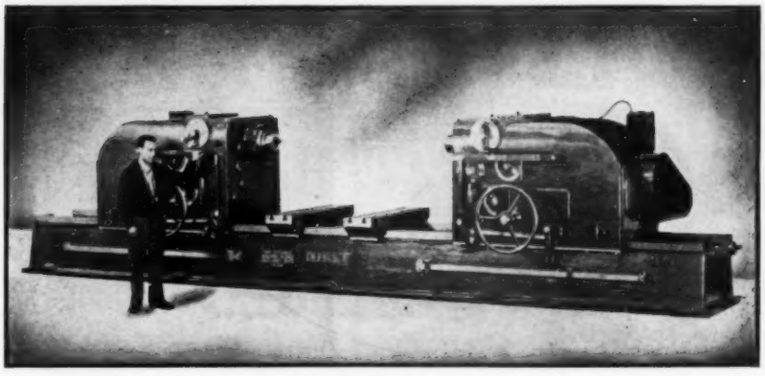
Type XM–30 "Cyclematic" broaching machine, manufactured by The Oilgear Company, 1319 W. Bruce St., Milwaukee, Wis., is shown set up for broaching three splines in bicycle coaster-brake hub shells at the rate of 540 pieces per hour. Each cycle produces three finished hub shells or a total of nine splines, each of which is 0.285 in. wide by 2 in. long. The three splines are 120 deg. apart.

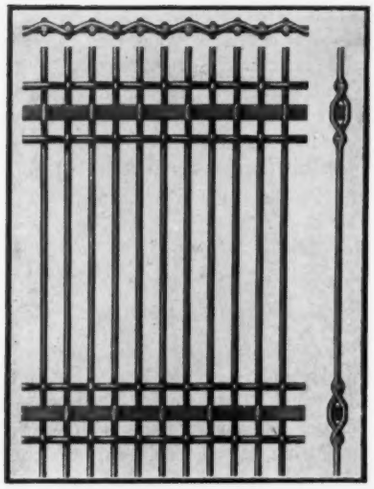
This broaching machine features a one-piece carriage, rack and pinion type adjustment for tool handling cylinder and slide pipe connections for upper cylinder. Double push button control requires the operator to remove his hand from the work before the cycle is started.

Defiance Two-Way Boring Machine

This heavy-duty, horizontal, two-way boring machine, designed and built by The Defiance Machine Works, Defiance, Ohio, is intended for boring, facing and counterboring pump casings and other large castings at opposite ends. Spindle heads have independently controlled drives, speeds and feeds. Each head is driven by V-belts from a 7½-hp. motor mounted on the rear of the head. Twelve spindle speeds, ranging from 8 to 225 r.p.m. are obtainable by sliding gears mounted on splined shafts. Four feed changes ranging from 0.0078 to 0.0625 in. per rev. of the spindle are available. Speed and feed changes are independent. Power rapid traverse and hand feeds in either direction are provided.

The spindles are 5 in. in diameter, and are mounted in precision Timken bearings. Machine bed is 25 ft. long and has 6 in. wide ways with a maximum spread of 34 in. One way is used as a guide for the head slides, which are 64 in. long. Each head slide has a 6 ft. movement on the bed, with maximum distance between spindle noses of 12 ft. Centers of spindles are 26 in. above top surface of work platens and 55 in. from the floor. The two work platens are 12 in. wide, 5 in. high and 48 in. long. Each may be positioned independently on the bed for mounting suitable work holding fixtures. Floor space required is 6 ft. by 25 ft. 8 in.; net weight is 29,475 lb.





"Sta-Tru" Long-Mesh Woven Wire Screens

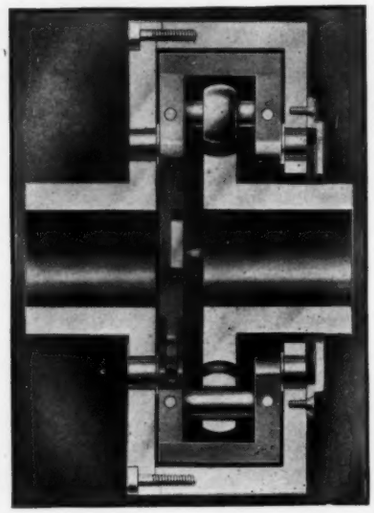
The Ludlow-Saylor Wire Co., Newstead Ave. & Wabash R. R., St. Louis, Mo., has announced development of an improved "Sta-Tru" long-mesh type woven-wire screen that is particularly adaptable for use on vibrating-screen equipment. This screen has been designed to give the advantages of maximum opening in the screening area that is inherent in the long-mesh type of screen, and to eliminate the tendency to stretch under tension.

Pull of tensioning members of the screening equipment is exerted exclusively on straight, uncrimped staybars of high tensile strength which are woven into the screen in combination with two or more crimped spacing wires. These spacing wires maintain the longitudinal screening wires in their proper relationship throughout the life of the screen. Test applications have demonstrated increased screening efficiency for this type of surface.

Harris No. 2 Flexible Coupling

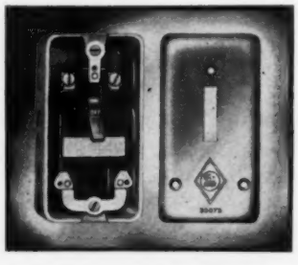
The Harris Coupling Company, 265 West 40th St., New York, N. Y., has announced the No. 2 universal self-aligning shaft coupling, which is similar in action to the No. 1 coupling previously described (*AM*—Vol. 80, p. 1022). The No. 2 type is suitable for all types of operation, while the No. 1 coupling is intended primarily for continuous motion machines.

The No. 2 coupling allows parallel misalignment of ¼ in., angular misalignment of 20 deg. either way and provides for ample end float. The internal mechanism is such that power is transmitted evenly through all the interior oscillating members regardless of the condition of misalignment under which the coupling may be operating. Two designs of internal mechanism are available. One type is constructed with the oscillating members held in relative position through gear teeth, as in the No. 1 coupling. The other type is constructed with bell cranks, which are interconnected to keep the members in correct relative position. A dust- and oil-tight cover surrounds and protects the coupling and serves to hold lubricating oil.



Colt Yoke-Mounted "Protectit" Circuit Breaker

The yoke-mounted "Protectit," announced by Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., is designed for assembly in standard metal wall boxes as well as in special metal cabinets. Two types of these compact auxiliary circuit breakers are available. One is a fixed capacity device, made in ten different size ratings. The other is an interchangeable heater-element type for which there are 20 heater elements, all with different ratings. Both types have a maximum voltage rating of 250 volts a.c. or d.c. and a maximum rating of 1 hp.

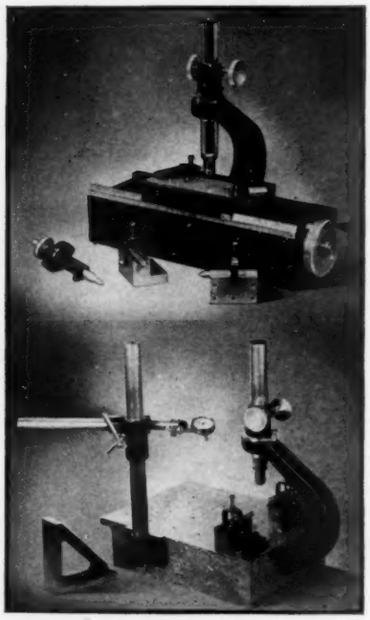


Mico Precision Measuring Tools

The Mico Instrument Company, 10 Arrow St., Cambridge, Mass., is offering a 20-cm. universal measuring engine designed for use in both laboratory and shop where careful measurements are required. Design is such that simple or fairly complex length measurement problems can be handled. The fundamental device consists of the bed, screw, nut and associated parts, together with a simple carriage, reading microscope, and microscope mounting.

With this equipment measurements of length of opaque objects 8 in. (20 cm.) or less in length are possible with an accuracy of 0.0001 in. and measurements of transparent objects of 4 in. lengths or less can be made. An accessory cross carriage having 2-in. movement is available. The addition of this carriage converts the engine to a two-coordinate measuring device of 2 x 8-in. range. Other accessories adapt the machine to varied uses.

A 3-angle surface plate, 9 x 12 in. in size and 3 in. high, is also offered. The three surfaces are scraped flat to 0.0001 in. and the three angles are 90 deg. within 0.00025 in. in the 12-in. length. This surface plate can be used as a base for mounting microscopes and other accessory equipment for accurate measurement.



Mico measuring engine, above, and surface plate, below, are suitable for a wide range of layout and inspection operations

Trane Model "VS" Vertical Unit Heaters

Model "VS" vertical unit heaters, offered by The Trane Co., LaCrosse, Wis., are available for applications where it is desired to cover a broad expanse of floor space with the direct stream of heated air from the unit.

These heaters are standard Trane propeller units embodying the features of "Cradle Coil" mounting, quiet operation and distinctive appearance, with an added nozzle.

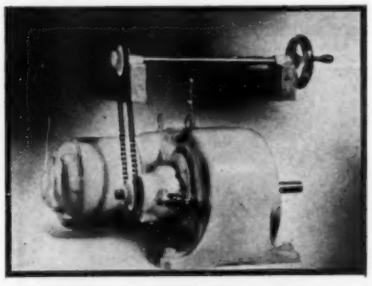
Cam-Operated Transitorq Control

The New Departure Manufacturing Co., Bristol, Conn., has announced a cam-operated control for the variable-speed Transitorq. Where a cam can be used for speed control purposes, this unit is mounted on the Transitorq and the follower arm is held against the face of the cam by pressure.

A rack cut on the follower arm meshes with a spur gear mounted on the vertical shaft of the control unit. This arm is free to slide back and forth when the Transitorq is not running. When the Transitorq is started or running, that is, when there is oil pressure against the control unit vane, the cam follower is forced against the cam by the return spring. No other pressure is needed to assure contact of the follower arm with the cam.

U. S. Varidrive Remote Control

U. S. Electrical Motors, Inc., Los Angeles, Calif., has announced a line of standardized parts for obtaining remote mechanical control of variable speeds when used in connection with the U. S. Varidrive motor. Bearing supports, shafting, sprockets and chains have been standardized so that



convenient and economical arangements can easily be made. Speed control is positive as there is no slippage in the mechanism. Infinite speed variation may be obtained.

B. & S. Stainless 1-In. Micrometers

Model 11-B and Model 59-B, 0 to 1 in. micrometer calipers offered by Brown & Sharpe Mfg. Co., Providence, R. I., are now fitted with stainless steel barrels and thimbles. The stainless steel protects against rust and stain. Where desired, these micrometers can be furnished with the measuring surfaces of the spindle and anvil faced with Tungsten Carbide.

These models measure from 0 to 1 in. by thousandths or 0 to 25 mm. by hundredths of a mm. The "I"

section frames are designed for strength with lightness and the anvils project $\frac{3}{8}$ in., a convenience in measuring slots.

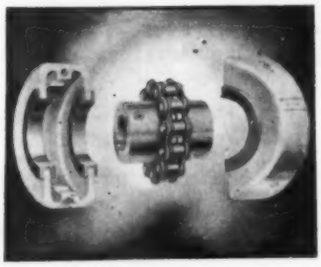
"Holo-Krome" No. 33 Wrench Set

The Holo-Krome Screw Corporation, Hartford, Conn., is offering a socket screw wrench set containing eleven, "file hard" spring tempered wrenches. This No. 33 set contains wrenches to fit all hexagon-type setscrews from No. 8 to 1-in. diameter

inclusive. These wrenches can also be used for capscrews from No. 8 to $\frac{7}{8}$-in. diameter inclusive and for all sizes of stripper bolts. The set is packed in a $6\frac{3}{4}$x4 1/3x$\frac{3}{4}$ in. metal box.

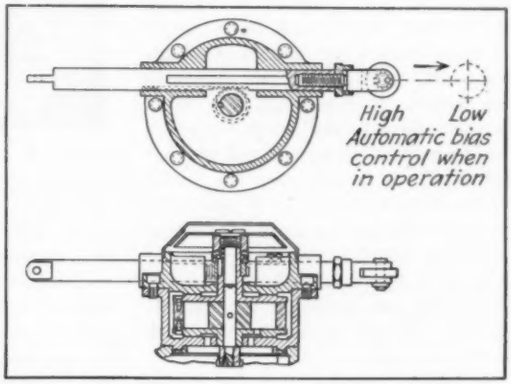
Whitney Flexible Coupling and Cover

The Whitney roller chain flexible coupling, manufactured by The Whitney Chain & Mfg. Co., Hartford, Conn., now has a compact cover designed to give adequate lubrication to the coupling chain and to permit



easy removal. The cover is driven by lugs on each half.

These couplings are made in the



Hydraulic pressure holds the cam follower against the control cam in this cam-operated Transitorq control

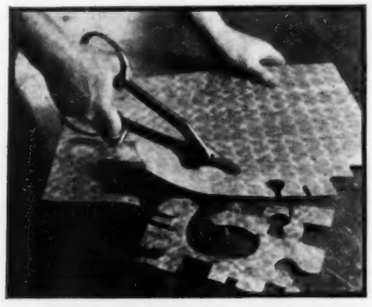
wide chain design to give maximum chain roll and sprocket tooth bearing area. They allow for motor end float and disconnect without moving shafts or bearings.

Una Welding Electrodes

Una Welding, Inc., 1615 Collamer Ave., Cleveland, Ohio, has announced the Una 3175 and 3195 welding rods for use in welding low-alloy high-tensile steels. These shielded arc electrodes consist of an alloy-base rod with full shielded coating. Alloy ingredients are added to the coating to give proper physical characteristics. The 1/8- and 5/32-in. electrodes are recommended for flat, vertical and overhead welding. In fabricating rigid structures using 3/4-in. plates or heavier of low-alloy, high-strength steel with these electrodes, a stress relief of the complete structure is recommended.

Wiss No. 9X Snip "Scroll Pivoter"

J. Wiss & Sons Co., Newark, N. J., is offering a metal cutting tool under the trade name No. 9X "Scroll Pivoter" Snip. This shear, because its design gives it the ability to pivot as it cuts, allows the user to follow curves and angles in cutting and trimming. The tool is 12 in. long and weighs 1 3/4 lb. It will cut metal up to 17 gage in all the intricate designs required for decorative pur-



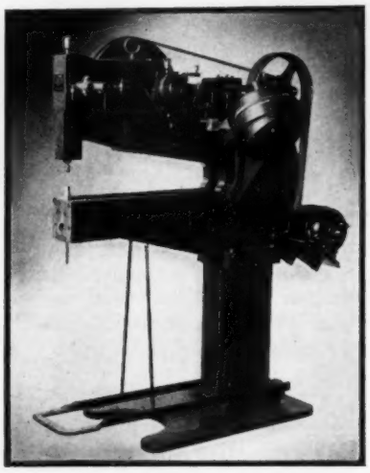
poses. Wear is automatically taken up, preventing burrs on the metal being cut.

M & W "Platelustre"

Colors, heretofore produced on metals by the anodic process and other chemical coloring methods, can be produced economically by a line of enamels developed by Mass & Woldstein Company, Newark, N. J. Marketed under the trade name "Platelustre," this enamel is semi-transparent and, when mixed with clear lacquers, gives a clear, brilliant, transparent colored effect that is said to be fast to light and durable. This enamel is furnished in a large assortment of colors. Metals of all kinds can be finished.

Tompkins-Johnson Underfeed Clincher

Tomkins-Johnson Co., Jackson, Mich., is now offering the "Clinchor" machine, for setting clinch nuts, with a 24-in. throat. This makes the machine particularly adaptable for large, awkward pieces. Throat depths



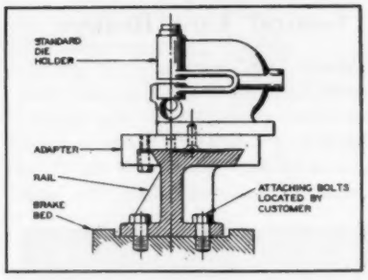
have previously been limited to 8 in.

As in previous machines, the clinch nuts are automatically fed to the ram. Work is located over the nut, which is then set by a single stroke of the ram. The ram stroke is actuated by a slight pressure on the treadle.

Wales Press Brake Die Units

Wales standard adjustable piercing or notching dies, manufactured by The Strippit Corp., 1559 Niagara St., Buffalo, N. Y., can be mounted on press brakes by attaching adapters to the die holders as shown in the sketch. A special rail is required to accommodate the adapters, which can be moved along the rail so that the dies may be adjusted lengthwise on the same center line. Where holes are not to be on the same center line undrilled adapters are supplied for drilling in the user's plant. Adjustable stops are available for mounting on the rail to locate the work in the die unit.

A line of piercing dies for angles



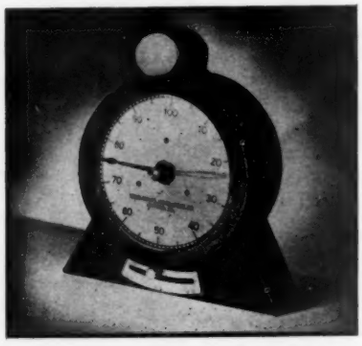
and shapes in which the holder width is 3/4 in. is available for a maximum punch diameter of 3/32 in., with a capacity for 1/8 in. aluminum alloy or steel. The die shoe can be machined to fit the press brake on which the die units are to be used.

Wilson No. 520 Welding Electrode

Electrode No. 520, announced by Wilson Welder & Metals Co., 60 East 42nd St., New York, N. Y., is designed for use with the small transformer type a.c. arc welders. It is claimed that an arc can be struck and maintained without difficulty when using this electrode.

"Production Guide" Cycle Timer

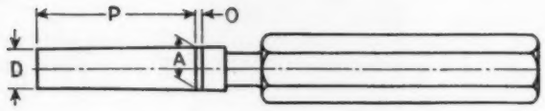
The Production Instrument Co., 1325 So. Wabash Ave., Chicago, Ill., has developed a precision timing device that can be adapted to regulating any repeated operation. This "Production Guide" instrument is adaptable for timing repeated operations or manufacturing processes



where it is desirable to provide a definite and uniform timing of certain portions of the operation. Various speeds can be arranged and any proportion of loading time and working time can be worked out. A solenoid-operated release for machine control can be provided in addition to the signal light or bell for which the instrument is designed.

Self-Holding Machine Tapers—II

Tables 4, 5, 6 and 7 published in this installment conclude the proposed American Standard for self-holding machine tapers



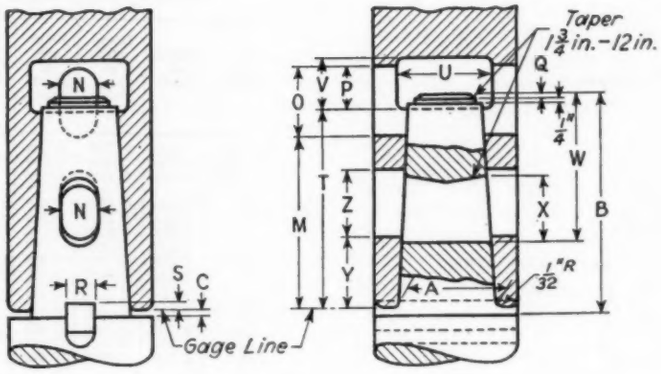


Table 6 Plug Gages

No. of Taper	Taper[2] per Foot	Diameter[1,3] at Gage Line A	Diameter[1,3] at Small End D	Length Gage Line to Small End P	O
.239	0.500	0.239	0.200	1 5/16	0.048
.299	0.500	0.299	0.250	1 5/16	0.048
.375	0.500	0.375	0.312	1½	0.048
1	0.600	0.475	0.369	2⅛	0.040
2	0.602	0.700	0.571	2 9/16	0.040
3	0.602	0.938	0.778	3 3/16	0.040
4	0.623	1.231	1.020	4 1/16	0.038
4½	0.623	1.500	1.266	4½	0.038
5	0.630	1.748	1.476	5 3/16	0.038
200	0.750	2.000	1.703	4⅝	0.032
250	0.750	2.500	2.156	5½	0.032
300	0.750	3.000	2.609	6¼	0.032
350	0.750	3.500	3.063	7	0.032
400	0.750	4.000	3.516	7⅞	0.032
500	0.750	5.000	4.422	9¼	0.032
600	0.750	6.000	5.328	10⅝	0.032
800	0.750	8.000	7.141	13⅜	0.032
1000	0.750	10.000	8.953	16⅛	0.032
1200	0.750	12.000	10.766	19⅜	0.032

All dimensions given in inches.

[1] Gage tolerance for diameters "A" and "D".
Sizes .239 to No. 3 inclusive, +.0001 − .0000.
Sizes No. 4 to No. 30 inclusive, +.00015 − .0000.
Sizes No. 35 to No. 120 inclusive, +.0002 − .0000.

[2] Taper per foot and diameter at "Gage Line" (Col. "A") are basic dimensions.

[3] Dimensions in column "D" are calculated for reference only.

Table 4 Key Drive with Shank Retained by Key

No. of Taper	Diameter at Gage Line[1]	Shank			Holdback Keyway in Shank[2]			Drive Keyway		Socket			Knockout Keyway[2]				Holdback Keyway in Socket[2]		
		Overall Length	Exposed Length	Bevel of Shank End	Small End to Top of Keyway	Length	Width	Width	Depth	End of Socket to Relief	Relief Diameter	Relief Depth	End of Socket to Keyway	Width	Length	Shank End to Keyway Bottom	End of Socket to Keyway	Length	Width
	A	B	C	Q	W	X	N	R	S	T	U	V	M	N	O	P	Y	Z	N
200	2.000	5¼	⅛	1/16	3⅛	1 1/16	0.656	1.000	½	4¾	1 13/16	1	4½	.656	1 5/16	1 5/16	2⅛	1 11/16	0.656
250	2.500	6	⅛	1/16	3⅛	1 1/16	0.781	1.000	½	5½	2¼	1	5 3/16	.781	1 5/16	1¼	2⅞	1 11/16	0.781
300	3.000	6¾	⅛	1/16	3 5/16	1 1/16	1.031	1.000	½	6¼	2¾	1	5 15/16	1.031	2 1/16	1½	3 9/16	1 11/16	1.031
350	3.500	7 9/16	⅛	⅛	3 13/16	2	1.031	1.000	½	7	3 3/16	1	6⅝	1.031	2¼	1 7/16	3¾	2⅛	1.031
400	4.000	8 5/16	⅛	⅛	4½	2¼	1.031	2.000	¾	7¾	3⅝	1	7¼	1.031	2⅜	1 7/16	3⅞	2⅜	1.031
500	5.000	9 15/16	3/16	3/16	4 15/16	2⅝	1.031	2.000	¾	9¼	4⅝	1	8¾	1.031	2¾	1¾	5	2⅝	1.031
600	6.000	11½	3/16	3/16	5⅞	3	1.281	2.000	¾	10¾	5½	1	10⅛	1.281	3¼	2 1/16	5⅝	3¼	1.281
800	8.000	14 9/16	3/16	¼	7 11/16	4	1.781	4.000	1	13¾	7⅜	1	12⅞	1.781	4¼	2⅝	6⅞	4¼	1.781
1000	10.000	17⅝	3/16	5/16	8 15/16	4¾	2.031	4.000	1	16¾	9 5/16	1	15¾	2.031	5	3 5/16	8¾	5	2.031
1200	12.000	20 11/16	3/16	⅜	10¾	5¾	2.531	4.000	1	19¾	11	1	18½	2.531	6	4	10	6	2.531

All dimensions given in inches. [1] See Table 6 for plug gage dimensions.

[2] Corners at entrance side of Keyways shall be chamfered at 45 deg. as follows: Nos. 20 to 35 inclusive, 1/16 in. deep; Nos. 42 to 60 inclusive, 3/32 in. deep; Nos. 80 to 120 inclusive, 1/8 in deep.

Tolerances

For Diameter of Shank and Hole at Gage Line (A)
All sizes, + .002 − .000.

For Width of Keyway (N)
+ .008 − .000.

For Width of Drive Keyway "R"
In Spindle, + .000 − .001.
In Shank, + .010 − .013.

For Concentricity of Keyway "N" with Center Line of Spindle, .007.

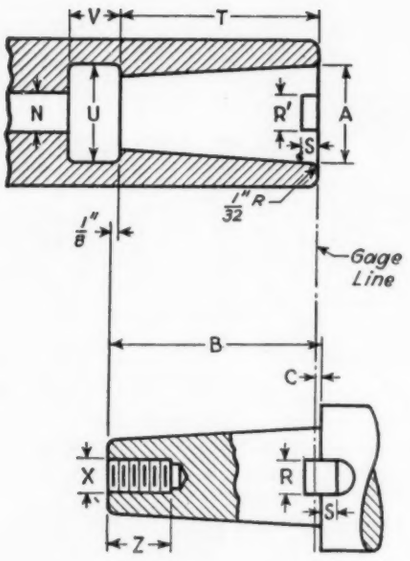
For Concentricity of Drive Keyway "R" with Center Line of Spindle, .002.

Tolerance on Fractional Dimensions + .010 and − .010, unless otherwise specified.

Dimensions of keyway across face of spindle, if required:
No. 3 width .385, depth 5/16.
No. 4 width .510, depth 3/8.
No. 4½ width .635, depth 7/16.
No. 5 width .760, depth ½.

For other dimensions, see Table 3.

Self-Holding Machine Tapers—II



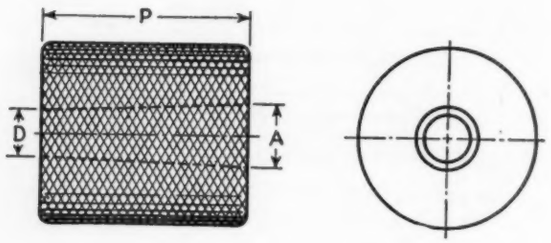


Table 5 Key Drive with Shank Retained by Draw Bolt

No. of Taper	Diameter at Gage Line	Shank						Socket					
		Overall Length	Exposed Length	N. C. Tap Size	Depth of Thread	Drive Keyway		End of Socket to Relief	Relief Diameter	Relief Depth	Diameter Draw Bolt Hole	Drive Keyway	
						Width	Depth					Width	Depth
	A	B	C	X	Z	R	S	T	U	V	N	R[1]	S
200	2.000	5	1/2	7/8	1 3/4	1.010	1/2	4 3/4	1 33/64	1	1	1.000	1/2
250	2.500	5 3/4	1/2	7/8	1 3/4	1.010	1/2	5 1/2	2 9/32	1	1	1.000	1/2
300	3.000	6 1/2	1/2	1	2	1.010	1/2	6 1/4	2 47/64	1	1 1/8	1.000	1/2
350	3.500	7 1/4	1/2	1	2	1.010	1/2	7	3 3/16	1	1 1/8	1.000	1/2
400	4.000	8	1/2	1 1/4	2 1/2	2.010	3/4	7 3/4	3 41/64	1	1 3/8	2.000	3/4
500	5.000	9 9/16	3/16	1 1/4	2 1/2	2.010	3/4	9 1/2	4 35/64	1	1 3/8	2.000	3/4
600	6.000	11 1/16	3/16	1 1/2	3	2.010	3/4	10 3/4	5 29/64	1	1 3/8	2.000	3/4
800	8.000	14 1/16	3/16	1 1/2	3	4.010	1	13 3/4	7 17/64	1	1 3/8	4.000	1
1000	10.000	17 1/16	3/16	2	4	4.010	1	16 3/4	9 5/64	1	2 1/4	4.000	1
1200	12.000	20 1/16	3/16	2	4	4.010	1	19 3/4	10 57/64	1	2 1/4	4.000	1

All dimensions given in inches. See Table 6 for plug gage dimensions.

Table 7 Ring Gage

No. of Taper	Taper per Foot[2]	Diameter at Large End[1,3]	Diameter at Back End[1,3]	Length
		A	D	P
.239	0.500	0.2390	0.200	1 3/16
.299	0.500	0.2990	0.250	1 3/16
.375	0.500	0.3750	0.312	1 1/2
1	0.600	0.4750	0.369	2 1/8
2	0.602	0.7000	0.571	2 9/16
3	0.602	0 9380	0.778	3 3/16
4	0.623	1.2310	1.020	4 1/16
4 1/2	0.623	1.5000	1.266	4 1/2
5	0.630	1.7480	1.476	5 5/16
200	0.750	2.0000	1.703	4 3/4
250	0.750	2.5000	2.156	5 1/2
300	0.750	3.0000	2.609	6 1/4
350	0.750	3.5000	3.063	7
400	0.750	4.0000	3.516	7 3/4
500	0.750	5.0000	4.422	9 1/4
600	0.750	6.0000	5.328	10 3/4
800	0.750	8.0000	7.141	13 3/4
1000	0.750	10.0000	8.953	16 3/4
1200	0.750	12.0000	10.766	19 3/4

All dimensions given in inches.

[1] Gage tolerance for diameters "A" and "D". Sizes to No. 3 inclusive, +.0001 − .0000. Sizes No. 4 to No. 30 inclusive, +.00015 − .0000. Sizes No. 35 to No. 120 inclusive, +.0002 − .0000.

[2] Taper per foot and diameter at "Gage Line" (Col. "A") are basic dimensions.

[3] Dimensions in column "D" are calculated for reference only.

Tolerances

For Diameter of Shank and Hole at Gage Line (A) All sizes, + .002 − .000.

For Drive Keyways Width R[1], + .000 − .001. Width R, + .003 − .000.

For Concentricity of R[1] and R .003 with center line of spindle.

Tolerances on Fractional Dimensions + .010 − .010, unless otherwise specified.

Round Table

Open House

"What do you think of the 'open house' idea, Ed?" asked Al when his friend entered the shop office on one of his weekly visits.

"Depends on whose house it is, Al. Are you thinking of throwing a party?"

"Not right now, Ed. I was thinking of the shop, not my home. A lot of companies welcome visitors at all times."

"Yes, I know, Al—the big automobile plants. It's good advertising for them, and they're set up with guides to pilot the public around and to answer foolish questions."

"I wasn't thinking of them, Ed, but the idea is the same. The other day I was passing a small plant, and right along the highway they had a big sign asking visitors to come in and look them over."

"It won't work in a small shop, Al. Work would be interrupted and you'd have to hire a detective to see that all the tools were nailed down. Besides I don't see what you'd gain. Our pumps aren't sold direct to the public so there wouldn't be much publicity value."

"There'd be some good will value though. At present we're only four walls to this community. The men come here in the morning and go home at night, but the average citizen doesn't know what we are doing or how we do it. If they had a chance to see the way we work and the pride we take in our product I'm sure we'd be regarded as more than a necessary evil. Then there are the wives and children of our men here. They'd like to see what Dad does during the day. They'd get a big kick out of seeing him operate a big planer or boring mill."

"Some plants set aside a 'family day' for that purpose, Al, but even that's a nuisance. As for keeping the latch key out all the time for any curiosity seeker that wandered by, I'd say it was out of the question.

Here you are minding your business and turning out pumps. Why can't other people mind theirs? There's no earthly reason why they should have the run of the shop."

"No reason at all, Ed, except that business today depends on its workers' good will and public good will. The fact that our door is open makes for a friendly feeling and destroys that forbidding atmosphere."

"What about those competitors of yours, Al? Won't they stroll in with the rest just to see how you got that last contract away from them?"

"If they come, Ed, they'll be welcome, too. We have no secrets here, and if their progress depends on snooping around, I know I'll always be two jumps ahead of them. Besides I'm all for interchanging information between plants. Industries that have done it have gone farthest to the mutual benefit of all the shops in them. The fewer trade secrets we have the better off we'll all be in the long run."

"Nobody can stop you, Al, when you're looking for trouble. My advice is to keep the open house at home. In the long run your men will thank you for keeping the crowd out of the shop."

Is it practical to give visitors the freedom of a small shop at all times? Or is Ed right in his belief that they should be excluded or limited to certain times?

Discussion

Not Naturalized

Any person earning or getting his living in a country should be expected to be a citizen of that country. To that end I would make it a condition that any person coming to the U.S.A. permanently, either to work, start a business, or live here, should be required to take out his papers as soon as he lands, the government to make a small charge for such papers. This would serve three purposes: save a lot of government money, do away with officials on naturalization boards, the government would know who is legally here and who is not and treat every one alike.

With regard to Al's stand of not giving a foreigner a job, why let him enter the country and then deny him the opportunity to work? Until it is made compulsory to take out citizenship papers, I would not discriminate between citizens or persons not citizens in regard to employment.

The writer is English and took papers out long ago, and when he was handed his final papers he was complimented by the presiding official and handed a flag by the president of the Daughters of the Revolution. In

a corner of the Stars and Stripes was printed "Made in Japan."

—ARTHUR SILVESTER.

A man who is not naturalized may well be a better man and a better producer than one who is. The fact that he has not yet become naturalized indicates loyalty to the land of his birth, and to his own kind; whereas the man who changes his loyalty easily for the sake of getting a job is likely to change it again quite as easily for more money. A man who does not quickly become naturalized shows by doing so that he has an independent spirit and faith in his own ability to earn his living without seeking any special privilege. To many people it appears quite right to require a foreigner to change his loyalty but not so right for their own countrymen to do so.

A good business man should always select men who will produce the best results, and if he does not it reflects against himself. Nationalism is good within proper limits, but outside those limits it fosters uncalled for antagonisms to men of other nations. —L. BROWN, *Montreal, Canada.*

It's true Americans seem to have a white collar complex, and many potentially good mechanics are yearly turned into third-rate doctors, lawyers and dentists. It's true many Americans dislike laboring work, while certain foreigners take to it naturally. Even so, all the Utopian philosophers to the contrary, we have just so many jobs in this country at this time. Until we have more jobs available, I'm for taking care of Americans first. I believe Al's policy is common sense, backed by good judgment, and is based on true American sentiment and not sentimentality.

—J. K. MATTER.

Good As New?

There are numerous turning and milling operations simple enough to be handled creditably on rugged, old style machines, using the new alloy tool steels and stepping up the spindle speeds. In the average run of work in the small shop, where simple setups are the rule, a high-speed production machine that would pay for itself on long run jobs would be at an expensive disadvantage where short runs are concerned. White elephants have no place in the job shop.

On the other hand, good judgment would turn down the rebuilding of an old machine where the schedule indicated a long run of repetitive work that had to be held to close limits. One cannot build modern accuracy into a machine designed for the more leisurely requirements of the Stanley Steamer era.—ROBERT S. ALEXANDER.

To the Lowest Bidder?

Not only are Al's arguments sound, but other good reasons can be cited for Al's position. Buckley may have bid low on several jobs with the result that he would be swamped as he would not have his organization perfected. Al's job might be delayed or prove faulty in workmanship, thereby delaying Al's production or causing a high percentage of rejects.

Sanson's long experience may be of benefit in showing up a weak place in design. A friendly suggestion might result in greater accuracy or a lower cost per piece which would quickly wipe out the difference in first cost and pay substantial profits.

Consideration of the general qualifications, financial responsibility and reputation of a bidder is established procedure. Otherwise government units as well as private concerns would not "reserve the right to reject any or all bids." The man who bids too low will be looking for every opportunity to "cut corners," while a more cautious bidder can do the job in a workman-like manner and give the job the extra touches hard to put in specifications and productive of greater satisfaction to all concerned.

—RALPH J. THOMPSON.

Any man who knows the costs and time studies of 30 years ago, with carbon steel tools, buttoning a jig, making a setscrew if one was needed and many more such expensive methods that were necessary in those days, and in contrast the costs of today with high-speed tools, modern machinery and small parts that can be purchased, can very easily put his finger on the correct bid.

Buckley worked for Sanson, and Buckley was progressive or he would not now be in a bidding position.

How does Al know that Buckley does not know how to figure costs? Or that he will fold up?

Let's not talk about philanthropy or wet nursing but consider some pertinent conditions. Maybe the Sanson Company, being an old concern, has a lot of old experienced mechanics who know how to make all kinds of parts and some old soldiers that Sanson does not have the heart to let go.

Buckley has all newer men and has no reason to be soft. He pays good wages, demands production, and gets it.

Sanson will button and bore the jig; Buckley will jig bore it. Sanson will make the drill bushings; Buckley will buy better ones for 50 cents apiece.

While Sanson is spending dollars making parts, Buckley is buying parts for pennies. It is easy to compare costs along these two lines and decide quickly which of the two is the correct bid.

Who knows the other man's methods? —W. E. FISCHER.

It would be interesting indeed if Buckley, admittedly a good mechanic, could overhear the conversation in which Al and Ed engaged. It would save him much grief, trouble and loss in submitting future bids if he should know all the factors.

Fellows like Buckley are by no means scarce, and though they do fold up right along some other fellow usually comes along to take their place and repeat their mistakes. Thus, the demoralizing effect of underbidding is perpetuated. I wonder whether we shall see the day when bids will be rejected with the explanation that they are obviously too low to allow both a good job and a legitimate profit. There can be little doubt that in a deal where all the profits go to one side, leaving the other at a loss, violence has been done to the balancing factors in trade, and everyone concerned is going to bear some of the loss. —JOHN E. HYLER.

One Foreman

Making one foreman responsible for both the day and the night shift is quite feasible and is often done where the night shift employed is small. A great deal of a foreman's work must of necessity be done during the day, such as that part which requires consultation with and cooperation of other executives who are only present then.

Having two foremen has its disadvantages: One of these is that it means the selection of a second foreman who will have to be discharged when the night shift finishes. There would probably be friction between the day and the night shift foreman, which would prevent smooth working of the shifts. A night-shift foreman, if appointed, would only have the routine production work to see to, a great deal of which would not need a foreman's attention.

—W. E. WARNER.

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Editorials

The President's Job in 1937

THIS TIME we are not talking about the man whose title is spelled with a capital P. He has a job on his hands that has seldom been equaled for difficulty, and we don't envy him. The presidents we mean are the men who head up the companies making machinery and manufacturing metal products.

In normal times the president of a company is supposed to divide his time between the various functions of his business: finance, sales, production, design. Theoretically he is equally interested in all functions, but practically he usually favors the function which he himself exercised before reaching the top, and leaves the others more or less to the functional chiefs.

But in abnormal times he must drop other interests and concentrate on that function which threatens trouble. In times of prosperity it may be production and deliveries that cause the most worry. When a depression starts it may be sales. When the bottom is reached it is likely to be finance. Right now it is industrial relations.

In the first stages of recovery men are so glad to see the pay envelope fatten up that they are content to work and pay off old debts. Later on, as costs of food and other necessaries rise, although wage rates have risen too, they discover that they are no better off than before and demand a larger share of the business income. Then they are ripe for the demagog and labor racketeer, and trouble is imminent.

We are now at the stage of the cycle when real wages are having a desperate time holding their own, and where the organizer has all the odds in his favor. If the recovery so far attained is to be held the presidents of our metal-working companies must recognize an emergency and devote most if not all of their time to their own internal labor relations. The other functions can be left to department heads, but this one matter should be the personal responsibility of the president himself.

IN ONE long established plant where some six hundred men are employed, the president spends half of his time going through the shops keeping personal contacts warm and friendly. He considers this the most important part of his job, and his success in avoiding labor trouble justifies his opinion. In another somewhat larger shop the unions took over the employee organization some time ago. The president assumed the sole responsibility of dealing with union committees, and has succeeded in getting them to do just about everything he wants them to do.

Labor leadership is more adroit than it used to be, it knows a lot of new tricks. But it is no more clever than the average company president. There is no reason why he should not be able to meet it in his own shop and defeat every move that is against the interests of his own men. After all, the president of a company has the interests of his workmen more at heart than any outside labor organizer can possibly have. His responsibility and his opportunity are clear.

Flood Troubles

THOSE manufacturers in the flooded areas whose contract forms absolve them from performance when prevented by "acts of God" may well invoke that clause today. The weather bureau experts say that the disastrous Ohio floods are not attributable to erosion or denudation of the watersheds, but to a rare combination of meteorological phenomena that resulted in abnormal precipitation. In other words, it rained a lot more than usual at this time of year, and did it in a very short time. Inevitable result—flood.

It will be weeks before the flooded machinery plants get back to normal production, and the already long deliveries will be lengthened still further. Human suffering is being alleviated as quickly as possible by the Red Cross, and by other local and national services including every branch of the federal government. Such aid comes first, of course, but the industrial plants deserve sympathy and aid from their customers who are being inconvenienced by a catastrophe that is in no sense the fault of the managements of the flooded plants.

The best way in which they can be helpful is to be lenient on delivery dates and leave their orders where they are instead of attempting to shift them to other suppliers in trouble-free areas. This policy may cost them something in dollars and in annoyance, but it is the thing to do.

CHIPS

WASHINGTON

Roosevelt decides not to buck injunction against TVA, calls off power pool studies, joins Secretary Perkins in criticism of General Motors executives . . . Miss Perkins asks Congress for subpoena power in strikes to force attendance of witnesses and producing of books and records, but gets little encouragement . . . President considering a new NIRA in which interstate commerce would be defined by Congress in an endeavor to avoid Supreme Court interpretation and definition . . . House passes bill to put postmasters under Civil Service . . . Navy yards will build the last three small vessels of the 1936 program, one destroyer at Philadelphia, another at Norfolk, and a submarine at Mare Island . . . Senator Borah defends Supreme Court, would have New Deal centralization theories submitted to popular vote . . . Briefs attacking Labor Relations Act presented before Supreme Court . . . Lines being drawn for fight on neutrality laws, Roosevelt wanting some discretion, opposition Senators holding out for none . . . Administration offers 6-year 5-billion public works program and scheme to revolutionize courts . . . Loophole in Walsh-Healey Act lets Navy buy some copper.

FOREIGN

Sabotage of British warships reported to Commons . . . Soviet trial of Trotzkyist plotters reveals wide plans to overthrow Stalin regime and brings out details of sabotage in industry and on railroads that has cost many lives, all but four are executed . . . Hitler announces that there will be no more "surprises," formally withdraws Germany's signature to that part of Versailles Treaty putting guilt for starting war on her, pledges cooperation for peace in Europe . . . Japan breathes a little more easily as relatively moderate Hayashi cabinet takes office . . . France supplies funds and professional aid for line of forts on German-Polish border . . . Chamber of Deputies votes arms program to match Hitler's . . . German '36-'37 military budget is 12,600,000,000 marks.

FINANCE

U. S. Steel made $50,000,000 in 1936, Bethlehem $13,000,000 . . . Federal Reserve Board goes limit of its powers by raising reserve requirements one-third, thus cutting excess to $500,000,000, and thereby hoping to forestall inflation . . . Bond prices upset by President's threat to Supreme Court.

INDUSTRY

Floods cripple industrial plants in valleys of Ohio and tributaries . . . P.R.R. announces decision to go ahead with electrification of lines between Philadelphia and Harrisburg at a cost of $50,000,000 . . . General Motors reopens some of its plants to provide at least part-time work for its men forced out by C.I.O. sit-down strikes, tells employees that it will carry insurance premiums for all until they get back to work . . . Striking West Coast seamen vote to end 3-months strike which has cost over $700,000,000 . . . Ohio flood, after doing many millions of damage, moves on into Mississippi to cause trouble along its course . . . Missouri Pacific gets court approval of purchase of 6 diesel locomotives, 2500 freight cars and 25 cabooses . . . Flint riots force throwing of cordon of troops around Chevrolet factory . . . Court orders strikers out of plants but they refuse to leave as C.I.O. "shock troops" from other cities move in to their assistance . . . Knudsen and Lewis meet in Governor Murphy's office "at President's request" but get nowhere as Lewis refuses to call out sit-downers and insists that C.I.O. be sole bargaining agent for all G.M. employees . . . Murphy hopeful of eventual agreement.

INDICATORS

Recession of floods allows steel production to recover . . . Electric power output off more than seasonally . . . Business Week's index declines slightly to 78.7.

FRED H. COLVIN

Thirty Years Associated with American Machinist

On January 28 Fred H. Colvin celebrated the thirtieth anniversary of his acceptance of a position on the editorial staff of *American Machinist*. His associates gave him an informal luncheon and presented him with a Leica camera for use on his annual vacation trip to Florida. He left shortly after the luncheon to drive to Orlando with Mrs. Colvin and relatives.

Chamber of Commerce Will Celebrate 25th Anniversary

With the theme of "Business Looks Ahead," the Chamber of Commerce of the United States will celebrate its 25th anniversary during the annual meeting in Washington, April 26-29. The National Council will meet on Monday, April 26, and the annual meeting will be held on the three following days.

Fostoria Pressed Steel Elects R. J. Carter

At the annual meeting of the Fostoria Pressed Steel Corporation, Fostoria, Ohio, R. J. Carter was elected president and general manager to succeed C. D. Pifer, who becomes chairman of the board. C. W. McDaniel, general sales manager, was advanced to the position of vice-president in charge of sales and will also be the company's secretary. E. L. Bates was named vice-president and R. L. Hill assistant treasurer. Mr. Carter continues as treasurer.

$200,000 Awaits Winners in Welding Paper Contest

Four hundred forty-six separate prizes will be awarded by the James F. Lincoln Arc-Welding Foundation to the best papers dealing with arc welding as a primary process of manufacture, fabrication or construction in eleven major divisions of industry. The principal prize winner will receive $13,700, the others from $7,500 down to $100. Contestants must file papers in duplicate with the Foundation secretary, A. F. Davis, P. O. Box 5728, Cleveland, not later than June 1, 1938.

This prize contest is the first activity of the Foundation since it was established at the close of 1936 as a tribute to James F. Lincoln. The eleven divisions of the prize contest are: automotive, aircraft, railroad, watercraft, structural, furniture and fixtures, commercial welding, containers, welders, functional machinery and industrial machinery.

Each major industry is sub-classified, and the five initial prizes for each sub-division are, $700, $500, $300, $200 and $100. Four papers from each industry will receive additional prizes of $3,000, $2,000, $1,000 and $800. Thus, 44 semi-finalists will get a total of $74,800. The four main prizes will be of $10,000 to $3,500, and will be selected from the semi-finalists. Complete details of all sub-classifications, rules and conditions can be obtained from Mr. Davis.

Testing Materials Congress

The International Association for Testing Materials will hold an International Congress in London, April 19-24 for the purpose of obtaining international cooperation in the study of materials and their testing, and to provide facilities for the exchange of views and experience. Authorities from some 20 different countries will attend. More than 200 papers will be presented. Copies of the list of papers can be obtained from the secretary K. Headlam-Morley, 28 Victoria St., London, S.W.1.

A.S.T.M. Annual Meeting Set

The American Society for Testing Materials will hold its 1937 (fortieth) annual meeting and fourth exhibit of testing apparatus and related equipment at the Waldorf-Astoria, New York, from June 28 to July 2, inclusive.

J. WALLACE CARREL

Wallace Carrel Is 70

Next week marks the seventieth birthday of one of the best known men in the machine tool industry, J. Wallace Carrel, vice-president and general manager, The Lodge & Shipley Machine Tool Co., Cincinnati. The exact date is February 16.

He started working with Lodge, Davis & Co. when he was 21 and then acquired additional knowledge and experience by connections with Charles E. Billin & Co., Chicago, Hill, Clarke & Co., of Boston, and the Draper Machine Tool Co. In 1908 he made a trip to Europe to study industrial conditions and shop methods for *American Machinist*. On his return he became general sales manager of Lodge & Shipley, and later general manager and vice-president.

Mr. Carrel has a host of friends in the industry here and abroad, thanks to his character and personality as well as to his business ability. His employees will not soon forget the efforts he made to keep them going when depression destroyed their regular jobs in the plant.

G.E. Sends Parts to Flood Area

More than 35 carloads of repair parts and materials have been shipped to the Cleveland warehouse by the General Electric Company so that impaired electric service in the flooded Ohio Valley may be restored as quickly as possible when the water recedes. The shipment consists mainly of transformers, lightning arresters and other distribution equipment. Men and supplies for relief activities are being concentrated at Cleveland.

Air-Conditioned Safety—A light fiber welding helmet, designed by H. S. Simpson (left), Caterpillar Tractor's safety engineer, includes pigmented lenses to repel infra-red rays and a filtered air line to drive out gases

Bausch & Lomb Adds to Research Laboratory

"Believing that the optical industry in America will meet increasingly keen competition from abroad, where low labor costs exist, Bausch & Lomb will engage in a broad program of fundamental investigations on the chemistry and physics of glass surfaces and in the development of new materials and processes for the industry," said Theodore B. Drescher, vice-president, under whose direction a new laboratory for applied research has been placed.

For this purpose 9,000 sq.ft. of space on the fifth floors of two buildings at the Bausch & Lomb plant in Rochester, N. Y., have been devoted to a series of laboratory units for research in the fields of metallurgy, experimental electro-plating, spectroscopy, photomicrography, and physical testing. Approximately $40,000 has been expended on these laboratory units and the staff of graduate chemical engineers and metallurgists has been increased about 50 per cent.

Ohio State Welding Conference

O. D. Rickly, general chairman, has announced that the Sixth Annual Welding Conference and Exposition sponsored by the Department of Industrial Engineering, Ohio State University, Columbus, Ohio, will take place on March 3-5 inclusive. This year's conference will include a special three-day course in arc welding design and practice under the direction of E. P. W. Smith, nationally known welding authority. The course will consist of morning and evening sessions devoted to lectures and practical welding demonstrations. Complete information can be obtained from Mr. Rickly.

Steel Engineers Meeting

The Association of Iron and Steel Engineers will hold its national meeting on Thursday, Feb. 25, at Youngstown in the ballroom of the Ohio Hotel. Such topics as the manufacture and use of rolls in the steel industry and continuous pickling tank construction will be considered.

Lincoln Gold Medal

The American Welding Society has announced the acceptance by the board of directors of a gold medal to be known as the "Lincoln Gold Medal," to be presented to the author of the best paper on any phase of welding published in the *Journal* during the year October 1936 to October 1937. The medal will be presented during the annual convention in October 1937.

J. F. Lincoln, president of The Lincoln Electric Company, Cleveland, has offered this award as a stimulus to the preparation of worth-while contributions to the art of welding.

A. I. M. E. 147th Meeting Will be Held in New York

The American Institute of Mining and Metallurgical Engineers will hold its 147th meeting, annual reception and dinner in New York at the Engineering Societies Building during the period February 15-18. An extensive and varied program is planned.

The Iron and Steel Division will hear several papers of interest. On Tuesday these will pertain to crystallization, and on Thursday to the iron-carbon equilibrium diagram and general ferrous metallurgy. Thursday afternoon, Dr. P. D. Merica, vice-president of the International Nickel Company, will give the Howe Memorial Lecture on "Alloy Cast Iron."

Fundamentals of stereographic projection in metallurgy will be presented by C. S. Barrett on Wednesday during the session of the Institute of Metals Division.

The annual dinner will be held on February 17 at the Waldorf-Astoria Hotel, with John M. Lovejoy, president, acting as toastmaster. The William Lawrence Saunders Medal will be presented to Erskine Ramsay, and the Anthony F. Lucas Medal to J. Edgar Pew.

Soviet Machine Exhibit

The Soviet Trade representative in Japan has opened a permanent exhibit of Russian-built machines in Tokyo to compete with American, German, Swedish and Swiss machinery. It is claimed there is no thought of competing with the low-price Japanese products, according to the U. S. Assistant Trade Commissioner Carl H. Boehringer.

Prague Spring Fair

An international fair will be held at Prague, Czechoslovakia March 5-14. More than 3,000 exhibitors will display goods, including machinery. Since Czechoslovakia lifted a good part of its import restrictions on January 1, countries importing its goods may expect a considerable increase in reciprocal trade.

Ball Bearing Man Honored

Albert Vuilleumier, superintendent of the Ball Plant of the New Departure Manufacturing Company, was given a testimonial dinner recently to mark his twentieth year of service with the company. He was presented with a motion picture camera.

WATCHING *Washington*

Pretense seen in President's proposal on Courts . . . Move smacks of political packing . . . Borah heads opposition . . . Clash likely over discretionary powers in neutrality law

WASHINGTON—Even if he had never criticised the Supreme Court's rulings on New Deal legislation, the President's bombshell on "judiciary reform" would have smelled of an attempt at packing; but in view of past direct jibes and thinly veiled innuendos, the entire message lacks frankness, to put it mildly. Had Mr. Roosevelt come out openly with a plea for his social and economic objectives, had he contended that a change in the federal court system was needed to achieve these aims, he could only be accused of attempting to subjugate the judicial arm of government to the executive. The approach he chose compounds this accusation to include pretense and indirection.

Briefly summarized the predrafted bill upon which Congress was asked to place its rubber stamp O.K. calls for:

1. Retirement of a federal judge within six months after reaching the age of 70 or else the President will appoint an additional judge. The total additions to federal courts are limited to 50, and the additions to the Supreme Court are limited to six.

2. Appointment of temporary circuit judges by the Chief Justice when dockets become congested. A proctor appointed by the Supreme Court would report on the volume of legislation in the circuit courts.

Constitutional Rulings

Presidential proposals do not end with this bill. In addition Mr. Roosevelt would prevent granting injunctions or decrees on constitutional questions until the court had given the Attorney General an opportunity to be heard. He also advocated immediate appeal to the Supreme Court of cases involving constitutionality, such cases to take precedence over all others.

The supporting evidence, a letter from Attorney General Cummings, lacks conviction. It deals almost entirely with crowded dockets in lower federal courts where conceivably an increased number of judges might prove effective. It does not show that fifteen Supreme Court justices could function more efficiently than nine and ignores the fact that the Supreme Court has for years been abreast of its calender. Nor does it appear to solve the old-age problem for there seems to be nothing in the current plan to prevent having fifteen 90-year old Supreme Court justices on the bench.

About all that there is left is to give the present Chief Executive power to make six Supreme Court appointments *whether or not any of the present justices chose to retire* and to push legislation of doubtful constitutionality ahead of all other matters before the courts. The President is playing largely on his popularity to drive through this flagrant attempt at domination; whether he succeeds or not depends on the degree of congressional subservience.

Senator Borah's radio address, four days before the President's message set him up as the spearhead of the opposition. The senator made an inspired plea for judicial independence; he stated that if the people desire that the Federal government shall have control over their local affairs it is for the people to say so; but the proper procedure is through constitutional amendment not by the administration's plan for "doing something about the court."

Another clash the President will face has to do with neutrality legislation. Mr. Roosevelt is eager for discretionary powers. The men who will fight him hardest on this are mostly Roosevelt men at heart although they embrace every category from the Republican Senator Vandenberg to the radical, almost Farm Laborite, Senator Nye of North Dakota.

The President thinks the best way to make certain in advance that the United States will be kept out of any world war is by taking two steps. The first is to place an absolute embargo on arms, munitions and implements of war (the language of the present bill). There is no dispute about this point.

But the second step in the President's plan is to vest in the White House absolute discretion as to how and when additional embargoes shall be imposed.

Fear Stills One Group

It might be thought that there would be a third group which would oppose embargoes even on arms and ammunition on the theory that these will certainly be made somewhere and that the U. S. might just as well have the resulting employment and at the same time build up its own war materials producing capacity against the day when this country may have to fight. There is plenty of thinking along this line in the war and navy departments and on Capitol Hill but it is not vocal. This sentiment is repressed by political fear.

The outcome of the fight will depend entirely on whether the opposition is able to convince the country that vesting any discretion in the President increases the possibility that the U. S. might be drawn into a war. If public sentiment should swing behind these senators all the power and prestige of the administration will be vain to stem the tide. This group would hold all shipments to belligerents to a cash and carry basis, in foreign bottoms, without American insurance—and no Presidential discretion.

Bottom for Tariffs

American manufacturers can figure roughly, though NOT with CERTAINTY, that new duty rates fixed in reciprocal trade treaties will not go below those of the tariff act of 1922. This is not announced policy—just happens to be the mental attitude of our State Department negotiators. They want to protect people who engaged in business on strength of 1922 protective rates, except where manifestly unnecessarily high.—Carter Field, *Washington Bureau, McGraw-Hill Publishing Co.*

Defiance Pressed Steel Is Host at "Open House"

February 11, 12 and 13 have been selected by H. F. Hadley, Vice-President of Defiance Pressed Steel Co., Marion, Ohio, as "Open House" days to give customers, suppliers and old friends an opportunity to inspect the new plant and facilities for producing metal stampings and complete welded assemblies. Formal invitations have been extended to a list of more than two thousand executives connected with industries served by the company.

Several departments of the new plant have been in operation for the past few weeks and every department will be ready for production when the visitors arrive. The new plant was started after fire had completely destroyed the former Defiance plant.

Chinese Textile Plant

Chinese interests have purchased 630 acres in Tientsin as a site for a 100,000-spindle textile plant, according to information received by the U. S. Bureau of Foreign and Domestic Commerce. The mill is expected to cost about $3,000,000.

American Shipyards To Launch 212 New Vessels

The Bureau of Marine Inspection and Navigation of the Department of Commerce has reported that American shipyards were building, or had under contract for private owners, a total of 212 vessels on January 1. This does not include vessels launched prior to that date.

The 212 ships reported have an aggregate total of 247,713 tons. Twenty-nine steel steam and motor sea-going vessels of 1,000 gross tons or more and eleven similar ships of less than 1,000 tons are now in process of construction. Nine wood steam and motor vessels of 100 tons or more and 162 unrigged steel vessels of 100 gross tons or more are also in the ways.

Announcement has recently been made of the appointment of the Taft-Peirce Manufacturing Co., Woonsocket, R. I., as exclusive distributor of Webber Gage Blocks, developed by George Webber of Cleveland.

Transit Industry Orders Buses and Plant Equipment

Purchases of new equipment by the transit industry in 1936 broke all previous records, according to the annual statistical number of *Transit Journal*, another McGraw-Hill publication. Of the 5,800 new vehicles purchased, the majority were motor buses, but the number of trolley buses ordered in 1936 almost equaled the total bought in all years since 1928. More new street cars were ordered than since 1930. Expenditures for improvements and maintenance totaled $267,994,600.

A. F. A. Milwaukee Show Committees Are Appointed

W. F. Bornfleth, of Cutler-Hammer Inc., Milwaukee, recently appointed general chairman of the Milwaukee Convention Committee and Walter Gerlinger, of Walter Gerlinger, Inc., general vice chairman, have announced the appointment of the various committees that will assist in arrangements for the Forty-First Annual Convention and Foundry Show to be held by the American Foundrymen's Association in Milwaukee, May 3 to 7, 1937. Plans are being made for one of the largest conventions ever held by the association.

During the annual meeting of the Foundry Equipment Manufacturers Association in Cleveland on Feb. 2, Robert S. Hammond of the Whiting Corp., Harvey, Ill., was elected president, and H. S. Hersey, of C. O. Bartlett & Snow Co., Cleveland, was elected vice-president. Arthur J. Tuscany, with offices at 632 Penton Bldg., Cleveland was re-elected secretary. O. A. Pfaff of the American Foundry Equipment Co., Mishawaka, Ind., Mr. Hammond, and Mr. Hersey are the new directors.

Industrial Review

• FLOODS have delayed shipment from plants in the Ohio Valley; the General Motors strike has held up orders in the automobile industry; but despite these adverse influences sales of industrial machinery are holding up surprisingly well. So far as machine tools are concerned, the year-end price increase, which pushed December orders to a record high, has caused a natural reaction. Labor difficulties seem to be concentrated in the motor plants; other industries and other communities are for the present free from employee trouble. It is too early to determine whether the President's attempt to pack the Supreme Court will have a detrimental effect on business.

• NEW ENGLAND, while experiencing some let-down, has plenty of inquiries which may soon blossom into orders. Some auto parts manufacturers are hesitant because of the strike. The New York district had good January sales though somewhat under the boom December level. Far from the strike and flood areas, Philadelphia feels the effect of lengthened deliveries but orders continue in good volume.

• PITTSBURGH finds its local labor quiet, but its steel plants are carefully following C. I. O.'s progress in the auto industry. January machine sales were satisfactory but below the high levels of December. With water still in its cellars, Cincinnati is busy cleaning up the muck left by the flood; this week will see a return to normal business. Deliveries from machine tool plants in this area will be delayed. Several plants, whose pattern storages were inundated, are particularly hard hit. The last ten feet of water came in very rapidly, doing much more damage than anyone had anticipated.

• DETROIT, bearing the full brunt of the strike conflict, went through January on a two-thirds level of industrial sales with prospects for February still lower. Dealers in this district are dependent on the auto industry for 85 per cent of their orders. Chicago, on the other hand, is a bright spot in the industrial world. January was a banner month and February has made a good start. St. Louis is optimistic also with demand steady and in good volume, despite a local General Motors strike.

Detroit LETTER

Trend toward fewer hours and more pay will require increased tooling programs . . . Chrysler may enlarge Jefferson Ave. engine building plant capacity by two-thirds, also Canadian output . . . Dealers store cars

Detroit, February 8—William Green, with the support of John P. Frey of the Metal Trades Division of the A. F. of L. telegraphed to Governor Murphy asking that any agreement reached in the General Motors strike should preserve and protect the bargaining rights of federation members. The A. F. of L. would be hamstrung if the U. A. W. were to gain its main demand—recognition as the exclusive bargaining agent of the workers—and knowing this Green has again jumped into the fight in an effort to maintain his own position and to embarrass the unrepentant Lewis. Today's conference seemed not to be getting anywhere when Green's move changed the situation. Since General Motors has remained adamant on the main issue, Washington will have to weigh Green's strength.

DETROIT—While the General Motors strike has had a depressing effect on equipment sales in the automobile industry, machinery builders are preparing for a rush of business in the near future. Regardless of what General Motors may do about 1938 tooling programs, the outlook for large outlays for machine tools is bright. Car manufacturers privately are convinced that the trend toward fewer hours of work and higher pay cannot be stopped and are setting out to devise ways and means of preventing manufacturing costs from becoming prohibitive. Soundest means is to install high-production, multiple-operation equipment which also relieves the operator of back-breaking tasks.

The motor industry has been so successful because it consistently has offered more product for less money each year. While the 35-hour week, which it is expected Ford will adopt before long, will increase labor costs, much if not all of that extra expense can be absorbed by production economies. Greatest savings can be made in replacing obsolete equipment with up-to-date machinery.

This urge for manufacturing economies has the merit of being a continuous affair for several years rather than a one-time splurge. The machinery builder therefore should enjoy business from it not only this year, but next. There is another angle to equipment modernization which shows industry's concern for the workman's well being. Ford is trying to eliminate what might be termed the "fatigue factor" from its factories. Wherever possible machinery is being installed which lightens the physical labor of the operator. There was a time when the workman in any automobile engine plant had to engage in exhausting physical labor, but mechanization has corrected that situation. Ford is spending large sums for equipment further to make the operator's task easier.

No Drastic Changes

No one knows exactly what General Motors divisions will do about '38 programs, aside from the Chevrolet decision apparently to let well enough alone, and probably the corporation executives don't know themselves. Fisher Body's pattern shops are understood to be full of work, indicating that at least some divisions have ambitious changes scheduled. However, it is the consensus of opinion that next year's changes by the entire industry won't be drastic enough to get excited about. Rear-engined cars and similar breaks with conventional design will be held off awhile. The attitude is, "Why gamble on something new when we probably will be able to sell all the cars we can build anyway?" The strike has set General Motors back so far that it won't want to be handicapped by a prolonged tooling period next summer.

All eyes are on Chrysler as it whips its equipment buying programs into shape. A final decision is about to be made on increasing engine-building capacity at the Jefferson Avenue plant in Detroit. This plant now turns out six-cylinder motors for De Soto, Chrysler and Dodge Truck divisions, but the production line is said to be hardly equal to peak demands.

1936 Automobile Facts

PRODUCTION AND VALUE	
Car and truck factory sales, U. S. and Canada	4,565,000
Passenger cars	3,767,000
Motor trucks	798,000
Percentage increase over 1935	11%
Wholesale value of cars, U. S. and Canada	$1,991,300,000
Wholesale value of trucks, U. S. and Canada	$ 457,625,000
Wholesale value of cars and trucks combined	$2,448,925,000
Wholesale value of parts and accessories for replacements, and service equipment	$ 874,687,000
REGISTRATION	
Motor vehicles registered in U. S.	28,270,000
Motor cars	24,250,000
Motor trucks	4,020,000
World registration of motor vehicles	40,000,000
Per cent of world's automobiles in U. S.	71%
TAXES	
Total motor vehicle user taxes	$1,400,000,000
Percentage motor user taxes to all taxes from all sources, federal, state and local	14%

Additional machinery may be installed to bring the output up from 75 to 125 engines per hour. There is talk again about possible expansion of Plymouth's capacity. The only way that Plymouth can make so many cars as it does is to keep its motor machining departments running almost continuously throughout the year so that finished motors can be built up ahead for use in the peak seasons. Plans were afoot a year ago for enlarging Plymouth's machining departments, but later were abandoned.

Chrysler has in its initial stages an elaborate expansion program for its Canadian division. This is said to include purchase of machinery to manufacture motors for Canadian cars at Windsor. The Canadian government is reported to be upping the Canadian content of cars made in the Dominion and to be ready to slap on heavier duties on parts shipped in from the United States. It has long been the practice of such companies as Ford and Chrysler to make castings, forgings and stampings in the Detroit area and truck them across the river to their Canadian factories. Chrysler's Canadian plans follow closely on the heels of those of Ford of Canada. General Motors already has transferred to its Canadian division the manufacture of a number of parts formerly made in Michigan plants of the corporation. This action by the Big Three puts the independent companies in an uncomfortable spot. They are said to be examining the situation carefully with a view toward transferring more work on Canadian cars across the border.

Car Dealers Order Ahead

Threatened labor trouble throughout the industry is having the effect of increasing dealers' commitments for cars. With John L. Lewis casting angry glances in the direction of Dearborn, some Ford dealers are ordering more cars than they hope to sell immediately and in some cases are warehousing them. Chrysler dealers too seem eager to get every car possible so that they will have stocks to tide them over any possible interruption of output. Even dealers in the flooded Ohio and Mississippi Valleys wired instructions to factories to continue shipping them cars as usual, despite their temporary inability to sell them. In the export trade foreign distributors and dealers are said to be ordering more cars than they need and storing them in New York for later delivery abroad.

Promotes Machinery Exports

Harris & Ewing, Washington

LEWIS M. LIND

Lewis M. Lind Becomes Chief of U. S. Machinery Division

Lewis M. Lind has been appointed Chief of the Machinery Division in the United States Department of Commerce, a branch of the Bureau of Foreign & Domestic Commerce. The Machinery Division concerns itself primarily with the promotion of machinery sales abroad.

A native Clevelander, Mr. Lind graduated from Yale University in 1929 then studied for a year at the University of Berlin. Upon his return to the United States he served in the foreign trade department of the Cleveland Chamber of Commerce and attended Cleveland College. After being connected with the Malleable Iron Research Institute and the Lake City Malleable Company Mr. Lind became one of the first members of the Ohio NRA staff in July, 1933. Later that year he went to Washington where he assisted in the administration of a number of machinery codes. Fourteen months ago he was appointed Acting Chief of the Machinery Division and his appointment as Chief at this time involves the same duties he has performed during the past year.

Duties are Complex

The Machinery Division, one of the eleven industrial units of the Bureau, advises the American machinery industries on problems connected with equipment export, keeps machinery builders posted on foreign market trends and publishes each month World Machinery News for the benefit of equipment exporters. With the machinery field embracing more than 130 trade associations Mr. Lind's job is somewhat complex. Total domestic machinery production goes above the four billion dollar mark in a good year and equipment exports are now running about $20,000,000 per month. The foreign sales volume of American machinery is greater than that of any other country at the present time.

The Machinery Division is currently conducting studies of export markets for specific types of machinery. Other activities are liaison work between machinery builders and the many branches of the government, and serving as an information center on machinery matters for federal agencies. One important phase of this is in connection with the machinery provisions of trade agreements.

F. E. M. A. Elects Officers

Robert S. Hammond, of the Whiting Corp., Harvey, Ill., was elected president and H. S. Hersey, of C. O. Bartlett & Snow Co., Cleveland, was chosen as vice-president of the Foundry Equipment Manufacturers' Association at the annual meeting recently concluded in Cleveland. Arthur J. Tuscany, of Tuscany, Turner & Associates, Cleveland, was re-elected secretary-treasurer of the organization.

Three directors were elected to replace those whose terms had expired. The new directors are: Mr. Hammond, Mr. Hersey and O. A. Pfaff, of the American Foundry Equipment Co., Mishawaka, Ind. The convention gave special attention to customers relations for the purpose of defining ways and means through which the equipment manufacturers could render maximum service to the foundry industry.

Spray-Painting School

One week training periods for those interested in learning the technique of spray-painting and the use and care of spray-painting equipment are offered by the DeVilbiss Co., Toledo, Ohio. Future classes during the first half of 1937 are scheduled to start on March 1, April 5, May 3 and June 7.

Special rates in Toledo hotels and boarding houses near the plant have been secured by the company for men attending the school. Size of each class will be limited and there will be no training periods other than those announced.

Steel Industry Will Spend $290,000,000 in 1937

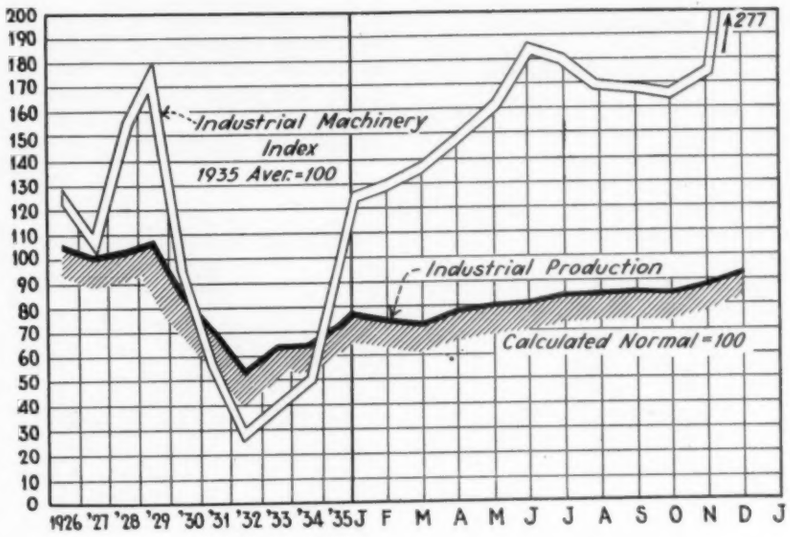
More than $290,000,000 will be spent during 1937 for new construction in the steel industry, or 45 per cent more than originally estimated for 1936 expenditures, according to the American Iron & Steel Institute. Almost every branch of manufacturing operations in the steel industry will be affected by the large-scale expansion program. New rolling-mill construction accounts for a large part of the total. Not only will certain continuous strip mills now under construction be completed, but five more are under way, or are about to be started. These will increase the number of continuous mills to 27, with an annual capacity of more than 12,000,000 tons of sheets, strips and plates. Blooming mills and new tinplate facilities will also be added.

Employment, Wages and Hours Continue to Gain

Manufacturing activity in December, as measured by the total number of man-hours worked, increased 3.9 per cent over November, according to the National Industrial Conference Board's regular monthly survey of wages, hours, and employment in 25 manufacturing industries. This gain was the result of an increase of 2.5 per cent in the number of workers employed and an advance of 1.2 per cent in the average hours worked per wage earner.

Hourly earnings averaged 63.5 cents in December as compared with 62.4 cents in November, an increase of 1.8 per cent. This rise in average hourly earnings in the face of a substantial increase in employment indicates that wage rates have been raised even to a larger degree than indicated by average hourly earnings. Average weekly earnings advanced from $25.83 in November to $26.62 in December, or 3.1 per cent. Although part of the rise in weekly earnings was offset by an increase in living costs, real weekly earnings were still 2.6 per cent higher than in November.

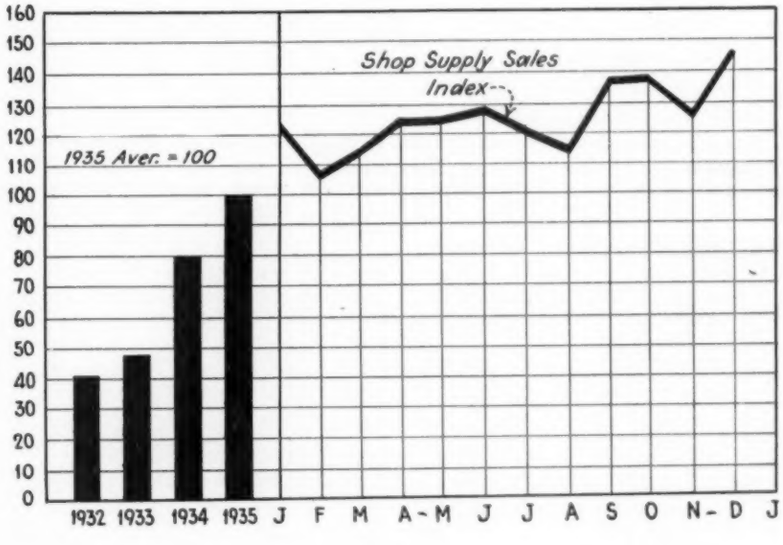
At the close of 1936, distinct gains were noted by the Conference Board as compared with conditions existing at the close of 1935. In December, 1936, there were 13.2 per cent more workers employed than in December, 1935, and their combined payroll was 28.8 per cent higher than a year ago.



December Industrial Machinery Index Goes Off the Map

Lifted principally by an unprecedented jump in machine tool orders, but helped materially by two out of the other three factors received in time for the preliminary calculation, the Industrial Machinery Index rose to 277, 100 points above the November final figure. When the other reports come in there may be a slight drop in the final figure, but it cannot be very much.

By comparison, the Index of Industrial Production compiled by Col. Leonard P. Ayres of the Cleveland Trust Company, proceeded peacefully along its upward path, up some 15 or 20 points from where it was a year ago.



Shop Supply Sales Recover Briskly

After a seasonal drop in November the Index of Sales of Shop Supplies made a vigorous counterseasonal recovery in December, reaching a new high for the year at 146.

Machine Tool Exhibit for Pacific Coast

Pacific Coast buyers and users of machine tool equipment will be afforded an opportunity to inspect a large group of modern tools and equipment at the exhibit planned by Herberts Machinery Co., Ltd., 2929 Santa Fe Ave., Los Angeles, Calif. This exhibit will be open for visitors beginning Feb. 8 and will continue until Feb. 14. Hours are 10 a.m. to 10 p.m. daily. More than 20 nationally known machine tool builders are participating and most of these will be represented by factory demonstrators.

Credit Meetings Scheduled by Machinery Manufacturers

A series of meetings of the credit men of the machinery industry have been scheduled to be held during the forthcoming Seventh Credit Congress of Industry, which will be held in conjunction with the forty-second annual convention of the National Association of Credit Men. The convention will meet at Hotel Stevens, Chicago, June 21 to 25, 1937.

The program planned includes round-table discussions of experiences with recent enactments of the Robinson-Patman and the Social Security Acts. The group will be headed by H. E. Kay, credit manager, Industrial Brownhoist Corp., national chairman.

Modification of Federal Relief Policy Urged

W. B. Warner, newly-elected president of the National Association of Manufacturers, has announced that the association will recommend a modification of Federal policy so that unemployed on relief rolls will feel more free to accept private employment without facing difficulty in regaining their places on the relief rolls should the employment be temporary.

A committee will be appointed to discuss the matter with relief officials in Washington at the earliest possible date in an effort to speed reemployment of the idle. Mr. Warner also suggested that an analysis be made of the abilities of those on relief rolls so that employers seeking additional employees might know the type of workers available. A census of the unemployed is held necessary to develop the location and kind of remaining unemployment so that efforts may be pointed directly towards its elimination.

Returns from a questionnaire covering firms employing almost 2,700,000 persons, approximately one-third of those in manufacturing industries, showed that employment at the beginning of January was 106.1 per cent of the 1929 level. These figures include the entire automobile industry, which reported employment as 16 per cent above 1929, and the steel industry, where employment was up 1.4 per cent.

Exports of Machinery During December, 1936

	December 1936	November 1936	December 1935
Electrical machinery and apparatus	$8,214,395	$7,630,837	$6,046,744
Power generating machinery (except automotive and electric)	921,089	683,012	716,418
Construction and conveying machinery	862,301	711,689	538,975
Mining, well and pumping machinery	3,503,585	2,859,878	2,723,948
Other metal-working machinery	276,250	250,373	318,954
Power-driven, metal-working machinery	3,913,820	3,785,013	3,444,611
Textile machinery	803,263	773,359	859,821

Exports of Metal-Working Machinery During December, 1936

	December 1936	November 1936	December 1935
Engine lathes	$203,803	$163,545	$144,188
Turret lathes	276,064	165,383	114,085
Other lathes	145,403	113,970	92,389
Vertical boring mills and chucking machines	128,008	167,253	246,166
Thread cutting and automatic screw machines	262,036	198,512	222,360
Knee and column type milling machines	178,067	118,212	84,412
Other milling machines	365,732	222,207	321,819
Gear cutting machines	120,893	96,275	161,203
Vertical drilling machines	201,130	106,768	20,144
Radial drilling machines	10,718	67,909	13,119
Other drilling machines	118,328	175,185	280,648
Planers and shapers	33,761	25,677	104,646
Surface grinding machines	151,799	97,639	214,109
External cylindrical grinding machines	97,679	73,555	147,069
Internal grinding machines	129,185	270,806	100,986
Tool grinding, cutter grinding and universal grinding machines	160,540	218,112	112,033
Other metal grinding machines	85,993	112,142	81,795
Sheet and plate metal working machines	203,658	410,903	160,094
Forging machinery	180,742	174,388	168,507
Rolling mill machinery	142,979	236,763	152,941
Foundry and molding equipment	100,984	63,389	167,751
Other power-driven metal-working machinery and parts	616,318	507,393	334,147
Other Metal-Working Machinery			
Pneumatic portable tools	101,944	67,858	54,793
Other portable and hand and foot operated metal working machines and parts	70,692	58,602	51,851
Chucks for machine tools	20,820	21,530	13,073
Milling cutters, machine operated threading dies and taps and similar machine-operated metal cutting tools	44,506	52,180	153,869
Other metal-working machine tools	38,288	50,203	45,368

PERSONALS

G. A. Ruehmling has become associated with Jewett F. Schrumm in the Schrumm Process Co., Providence, R. I., builders of controlled-atmosphere furnaces for bright annealing, brazing and special metal-treating processes. Mr. Ruehmling was formerly with the General Plate Co., Attleboro, Mass., as manager of sales and engineering. He brings to Schrumm Process Co. a varied experience in fabrication and application of ferrous and non-ferrous metals in solid and clad forms. In his new position he will supervise the manufacture and sale of the company's equipment.

Eugene N. Bittner has been placed in charge of time study for the Inland Manufacturing Division, General Motors Corp., Dayton, Ohio. Mr. Bittner succeeds to the vacancy made by promotion of E. E. Bollinger, to supervisor of the standards department.

K. L. Ames, Jr., has been elected president of the Automatic Products Corp., Chicago, Ill. Mr. Ames succeeds George C. Fleener who becomes vice-president and treasurer of the company.

Archie T. Colwell, director of engineering for the Thompson Products Inc., Cleveland, has been made a vice-president and will supervise the company's engineering activities in Cleveland, Detroit and St. Catherines, Ont.

Harold R. LeBlond, formerly secretary-treasurer, has been elected president of the LeBlond-Schacht Truck Co., Cincinnati, to succeed William Schacht, who remains as vice-president.

C. M. Houck, formerly manager of the Inspection Division, Pittsburgh Testing Laboratory, was elected vice-president. His predecessor in the vice-presidency, A. R. Ellis, was elected president.

Returns to Gar Wood

RALPH S. JENKINS

RALPH S. JENKINS has been named vice-president in charge of manufacturing of Gar Wood Industries, Inc., Detroit, according to an announcement made by LOGAN WOOD, vice-president and general manager. In 1921 Mr. Jenkins became associated with the Wood Hydraulic Hoist & Body Co. and rose rapidly to director of all branches. In 1932 he was appointed general manager of the St. Paul Hydraulic Hoist Co., of Minneapolis.

E. A. TURNER, vice-president of The Standard Stoker Company, Inc., has been appointed vice-president and general manager in charge of operations, with headquarters as formerly at 350 Madison Ave., New York.

C. G. FRANTZ, president of the Apex Electrical Mfg. Co., Cleveland, was re-elected president of the American Washing Machine Manufacturers' Association at the annual meeting.

OBITUARIES

DAVID A. CRAWFORD, 88, founder and owner of the Crawford Foundry & Machine Co., Emlenton, Pa., died recently.

WILLIAM DOUGLAS RIGNEY, for many years superintendent of machinery for the Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., died on January 25 at the age of 57.

WILLARD KELLS, 68, formerly general superintendent of motive power of the Atlantic Coast Line Railroad, died at Wilmington, on January 18. He resigned because of ill health in 1923.

BUSINESS ITEMS

The Serrick Corp., Defiance, Ohio, which has operated the Acme Machine Products Co., since November 18, has recently completed the purchase of the John Lees Co., Indianapolis, and the business will be transferred to Muncie, Ind. C. R. POOLE, who is general manager of the Muncie division of The Serrick Corp., made the announcement. Approximately 650 persons will be given employment by the new division and the machinery and equipment is being moved in at the present time. S. D. MURPHY, of Indianapolis, former president and general manager of the John Lees Corp., was elected vice-president and a director of The Serrick Corporation.

Other Muncie Division officers are as follows: JOE S. NEFF, production manager; ROBERT SHAFFER, assistant production manager in charge of the John Lees Co. output; ALBERT F. WESTLUND, former John Lees vice-president and chief engineer, is chief engineer, RAY WISE, assistant chief engineer; JAMES PERRY, general plant superintendent, and JOHN KARSNAK, superintendent of the John Lees Co. The products of the John Lees Co. are principally rolled metal moldings and stampings.

Morse Bros. Machinery & Supply Company, Denver, Colo., which has been in business for more than 40 years, was sold in January to the Denver Metal & Machinery Co. of which MAX GRIMES is president and J. T. MCSHANE, vice-president. The new headquarters will be at 2900 Broadway, Denver. GEORGE G. MORSE, former head of the business, will retire and devote his time to mining interests in Nevada.

Lindberg Engineering Co., Chicago, has appointed L. A. SHEA, formerly Chicago district manager for the Hevi Duty Electric Co., as assistant sales manager. Mr. Shea was with Hevi Duty for eleven years, most of the time in the engineering department.

The New Departure Manufacturing Co. has announced removal of the San Francisco office to 910 Polk Street.

The Emerson Electric Mfg. Co., St. Louis, has recently moved its offices to new and modern facilities at 1824 Washington Ave. The space formerly occupied at 2018 Washington Ave. has been absorbed by the manufacturing department.

Tube-Turns, Inc., Louisville, Ky., has moved from its old location at 425 Fifth St. to new and larger quarters at 224 East Broadway.

The American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind., has announced that contracts for an expansion program have been let. The program will double the space available for manufacturing and assembly. The addition will be used for assembly of specially designed "Wheelabrator" equipment.

The Monarch Machine Tool Co., Sidney, Ohio, builders of lathes, has opened its own office in Pittsburgh in the Chamber of Commerce Building, and will sell direct in the Pittsburgh territory. ELMORE L. ROSS is in charge.

Ajax Flexible Coupling Co., Westfield, N. Y., has opened its twenty-first district sales office at Louisville, Ky. ALFRED HALLIDAY, with headquarters in the Starks Building, will render personal engineering service to manufacturers in that area.

The Bunting Brass & Bronze Co., has opened a new branch sales office and warehouse at 296 Ivy St., N. E., Atlanta, Ga.

Foote Bros. Gear & Machine Corp., Chicago, has appointed H. F. Edge & Co., 987 Cox Ave., Atlanta, Ga., as district representative in the southeastern territory.

The Lincoln Electric Co., Cleveland, Ohio, has appointed W. R. SMITH to the sales staff of its Los Angeles office, 812 Mateo Street. Mr. Smith has been employed in the welding field for ten years.

Compressed Industrial Gases, Inc., Chicago, heretofore a holding company, now becomes an operating company and the nine former subsidiaries will operate under the name of Compressed Industrial Gases, Inc. The company is engaged in the manufacture and distribution of oxygen, hydrogen and acetylene as well as gas and electric welding equipment throughout the middlewest, southeast and southwest.

Carboloy Co., Inc., Detroit, has appointed FRED SCHONBERGER as an additional representative in the Philadelphia territory. Mr. Schonberger has been associated with the cemented-carbide field for several years.

The Swan-Finch Oil Corp. has moved the executive offices and New York sales offices from 205 East 42nd St. to larger and more centrally located offices at 30 Rockefeller Plaza.

EXPORT OPPORTUNITIES

• Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

Shoe - manufacturing machinery. (Agency.) Seoul, Japan. *2347.

Sugar-cube-making machines. (Purchase.) Guraru Mills, India. *2353.

Weighing and packing currants, automatic. (Purchase.) Liverpool, England. *2352

Albumen maufacturing machines and equipment. (Purchase.) Dublin, Irish Free State. *2393

Machine tools (Purchase and Agency.) London, England. *2398.

Rolling machines for the manufacture of metal picture frames. (Purchase.) Toronto, Canada. *2392.

References concerning these South American agents are on file and may be had upon request.

WILL L. SMITH, S. A., Commercial e Industrial, Luis Saez Pena No. 443 y 447, Buenos Aires, Argentina, S. A., has expressed an interest in American industrial machinery and petroleum equipment.

EDUARDO CHAME, Republica do Peru No. 55, Rio de Janeiro, Brazil, S. A., is interested in industrial machinery and public works construction machinery.

ERNESTO COLOMBELLI, Rua Augusto Severo No. 33, Sao Paulo, Brazil, S. A., wants information on industrial machinery, railroad and maintenance equipment.

JOSE M. SALAZAR, Ed. de la. Cia. Colombiana de Tabaco No. 507, Bogota, Colombia, S. A., has expressed a desire for information on railroad supplies and road building machinery.

JACOBO GUTMAN, Apartado No. 35, Heredia, Costa Rica, C. A., is in a position to take on additional lines of industrial machinery, railroad and water works equipment and general construction equipment.

LUIS CRUCET VALERA, Apartado No. 2477, Havana, Cuba, desires information concerning electric power and maintenance equipment.

HUGO MAY, Teniente Rey No. 55, Havana, Cuba, has shown an interest in industrial machinery and maintenance equipment.

ARCH F. COLEMAN, Edificio Banco Mexicana, Mexico, D. F., Mexico, wants contacts with American manufacturers not now represented in Mexico and is interested in industrial machinery, railroad and electric power equipment.

JOAQUIN FORMOSA, JR., Bolivar 25, Mexico, D. F., Mexico, represents American firms and is interested in American machinery.

PATENTS

January 19, 1937

Metal-Working Machinery

Testing Apparatus (Rotating Unbalance). Erwin C. Cooper, Roseville, Mich., assigned to Packard Motor Car Co., Detroit, Mich. Patent 2,067,892.

Drilling and Tapping Machine. Eric J. Stahlhammer, Bridgeport, Conn., assigned to The Bodine Corp., Bridgeport, Conn. Patent 2,068,084.

Parts and Mechanisms

Clutch Mechanism (Magnetic). Florence C. Biggert, Jr., Crafton, Pa., assigned to United Engineering & Foundry Co., Pittsburgh, Pa. Patent 2,068,260.

Processes

Method of Making Double Cut Files. Huber Ufer, Berlin, Germany. Patent 2,068,622.

Tools and Attachments

Combination Angle Indicator and Try Square. Everett Harson Galford, Covington, Va. Patent 2,068,128.

Electric Spray Gun for Shellac, Paints, etc. Elmer A. Steckel, Jr., and Elmer H. Bridenbaugh, Denver, Colo. Patent 2,068,205.

Air Valve for Spray Guns. William R. Brown, Chicago, Ill. Patent 2,068,225.

Scale (Underweight & Overweight). John E. Woodland, Columbus, Ohio, and Paul J. Kircher, Brooklyn, N. Y., assigned to The Jacobs Bros. Co., Inc., Brooklyn, N. Y. Patent 2,068,255.

January 26, 1937

Metal-Working Machinery

Milling Machine. Arthur F. Bennett, West Barrington, and August L. Krause, Providence, R. I., assigned to Brown & Sharpe Mfg. Co., Rhode Island. Patent 2,068,840.

Pressure Casting Machine. James N. Smith, Westfield, N. J., assigned to Aluminum Company of America, Pittsburgh, Pa. Patent 2,068,875.

Direct Current Welding Apparatus. Hendrick Abraham Wijnand Klinkhammer, Eindhoven, Netherlands, assigned to N. V. Philips' Gloeilampenfabrieken, Eindhoven, Netherlands. Patent 2,068,883.

Broaching Machine. Francis J. Lapointe, Ann Arbor, Mich. Patent 2,068,884.

Milling and Profiling Machine. Erwin G. Roehm, Norwood, and Millard Romaine, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati, Ohio. Patent 2,068,889.

Automatic Three-Dimensional Pattern Controlled Milling Machine. Bernard Sassen, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati, Ohio. Patent 2,068,890.

Centrifugal Quenching. Hendrick J. Gregg, Waterloo, Iowa. Patent 2,068,913.

Drill Grinding Appliance. Gordon D. Hardin, Louisville, Ky. Patent 2,068,915.

Automatic Punching and Riveting Machine. Lloyd D. Marchant, Detroit, Mich. Patent 2,069,042.

Knife Grinder. Percy H. Root, Plymouth, Ohio, assigned to The Fate-Root-Heath Company, Plymouth, Ohio. Patent 2,069,097.

Metal-working Machine. Harry W. Rupple, Shaker Heights, Ohio, assigned to The Cleveland Automatic Machine Company, Cleveland, Ohio. Patent 2,069,098.

Machine Tool. William F. Groene, Walter R. Meyer, and George W. Luning, Cincinnati, Ohio, assigned to The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. Patent 2,069,107.

Parts and Mechanisms

Metallic Packing for Variable Pressures. Harley T. Wheeler, Dallas, Tex. Patent 2,068,723.

Transmission Mechanism of the V-Pulley Type. Geoffrey Joseph Abbott, London, England, assigned to P. I. V. Chain Gears Limited, London, England. Patent 2,068,784.

Mechanism for Power Transmission. Carl F. Rauen, Grosse Pointe, Mich. Patent 2,068,869.

Hydraulic Reciprocating Motion Device. Albert E. Weaver, Indianapolis, Ind. Patent 2,069,122.

Friction and Direct Drive Coupling. James Arthur Clark, Ngaruawahia, New Zealand. Patent 2,069,132.

Reciprocating Table Drive Mechanism for Machine Tools. William H. Feeney, East Providence, R. I., assigned to Brown & Sharpe Manufacturing Company. Patent 2,069,138.

Processes

Manufacture of Nuts. Jerome W. Howard, Detroit, Mich. Patent 2,069,008.

Tools and Attachments

Soldering Iron. William Amos, Detroit, Mich. Patent 2,068,728.

Power Tool. Walter Hall, Los Angeles, Calif., assigned to J. Michael O'Meara, Los Angeles, Calif. Patent 2,068,745.

Apparatus for Finishing Bearing Surfaces. Harry C. Satterthwaite, Southfield Township, Oakland County, Mich., assigned to Cogsdill Manufacturing Company, Inc., Detroit, Mich. Patent 2,069,099.

MEETINGS

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS. 147th meeting, Feb. 15-18. Engineering Societies Bldg., 29 West 39th St., New York, N. Y.

ASSOCIATION OF IRON AND STEEL ENGINEERS. National meeting, Ohio Hotel, Youngstown, Ohio. Feb. 25.

CHAMBER OF COMMERCE OF THE UNITED STATES. Twenty-fifth anniversary meeting. Washington, D. C. April 26-29. D. A. Skinner, secretary.

CHICAGO NATIONAL BOAT & SPORTS SHOW. Navy Pier. Feb. 28-March 7. H. H. ERICKSON, manager, Navy Pier, Chicago.

KNITTING ARTS EXPOSITION. Commercial Museum, Philadelphia. April 19-23. A. C. RAU, secretary, 327 Park Square Bldg., Boston.

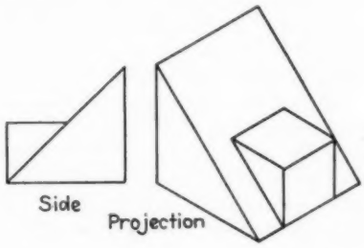
NATIONAL OIL BURNER & AIR CONDITIONING EXPOSITION. Philadelphia, Pa., March 15-19. C. F. CURTIS, secretary, 30 Rockefeller Plaza, New York.

NATIONAL RAILWAY APPLIANCE EXHIBITION. Chicago, Ill. March 15-18. C. W. KELLY, 910 S. Michigan Ave., Chicago.

PACKAGING EXPOSITION. Hotel Penn, New York. March 23-26. Show managers — Roberts Everett Associates, 232 Madison Ave., New York.

Answer to Drawing Puzzle

HERE are the side and projection views of the drawing puzzle (*AM* —Vol. 80, page 10) put to J. E. Moore by his trade-school students. Was this your idea of how they would look?

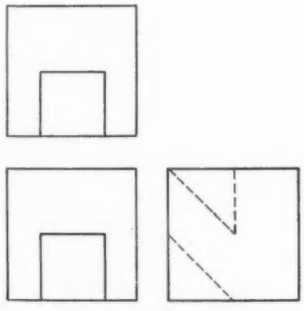


Correct solutions were submitted by:

ROBERT R. DECORMIER
A. R. KLIGMAN
J. K. MATTER
L. D. PLASSMEYER
WM. M. SIESEL

Another solution by:

PAUL C. BRUHL



Short Cut for Computing Reduction of Area

H. M. FRIEND

WHEN making physical tests of metals one of the important factors usually required is reduction of area. This is determined when making the tensile strength test by measuring the original diameter of the round sample and after fracture the final diameter at point of fracture. The original area and the final area are then calculated by slide rule or are taken from tables. By definition, the percentage reduction of area equals the original area of cross-section of the test piece minus its final area at point of fracture divided by the original area.

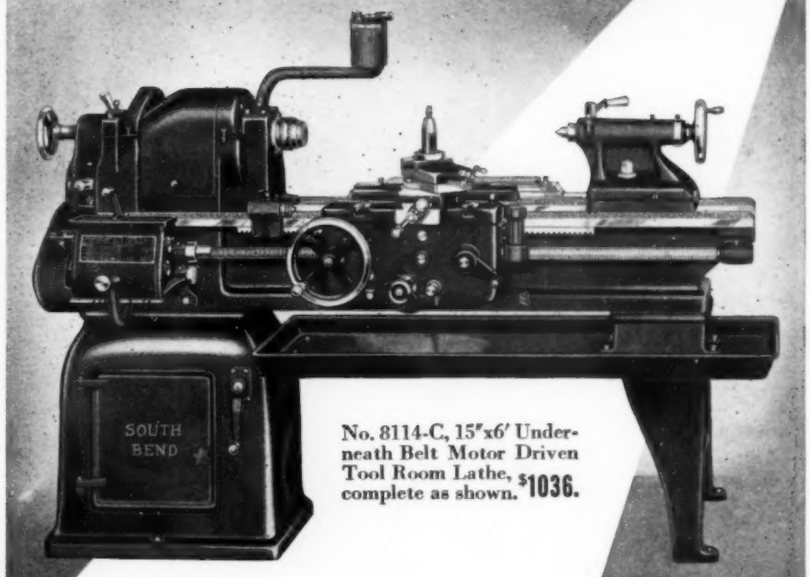
An easy way of calculating this percentage from one setting of the slide rule is as follows:

Example: A test piece 0.505 in. in diameter has at point of fracture a diameter of 0.400 in. Set the runner to 505 on scale *D;* set 400 on scale *C* over the 505 on scale *D*. Then on scale *B* under 10 on scale *A* at the extreme right of the rule read 629. Subtract 629 from 1,000 and obtain 371. Place a decimal point before the last digit, thus, 37.1 and obtain the percenage reduction of area.

This subtraction may be read directly from the slide rule by subtracting mentally from 10 the 7 on scale *B* which is the next number printed on scale *B* beyond the calculated 629. This gives 3. Then counting divisions on scale *B* from 7 (now called 3) we obtain 371 which is the answer, 37.1 per cent reduction in area of the test specimen.

This procedure has been checked against tables of areas and the results were within 1.10 of 1 per cent. The speed and ease of this method are greater than the usual method and facilitate routine calculations.

NEW 1937
SOUTH BEND *Precision* LATHES



No. 8114-C, 15″x6′ Underneath Belt Motor Driven Tool Room Lathe, complete as shown. $1036.

THE new 1937 Series of South Bend Back-Geared, Screw Cutting Precision Lathes with Double Wall Aprons and hardened and ground headstock spindles are recommended for the finest and most accurate work in the tool room, machine shop, manufacturing plant, and laboratory. Offered in sizes from 9″ to 16″ swing, in bed lengths from 3′ to 12′, Underneath Belt Motor Drive, Countershaft Drive, and Pedestal Motor Drive.

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Catalog No. 96 illustrates, describes, and prices the new 1937 Series of South Bend Precision Lathes in all sizes and styles. A valuable book for the shop man, engineer, and plant executive. Sent free, postpaid, upon request.

MODERN LATHES FOR MODERN INDUSTRY

How to Grind to Half a Tenth

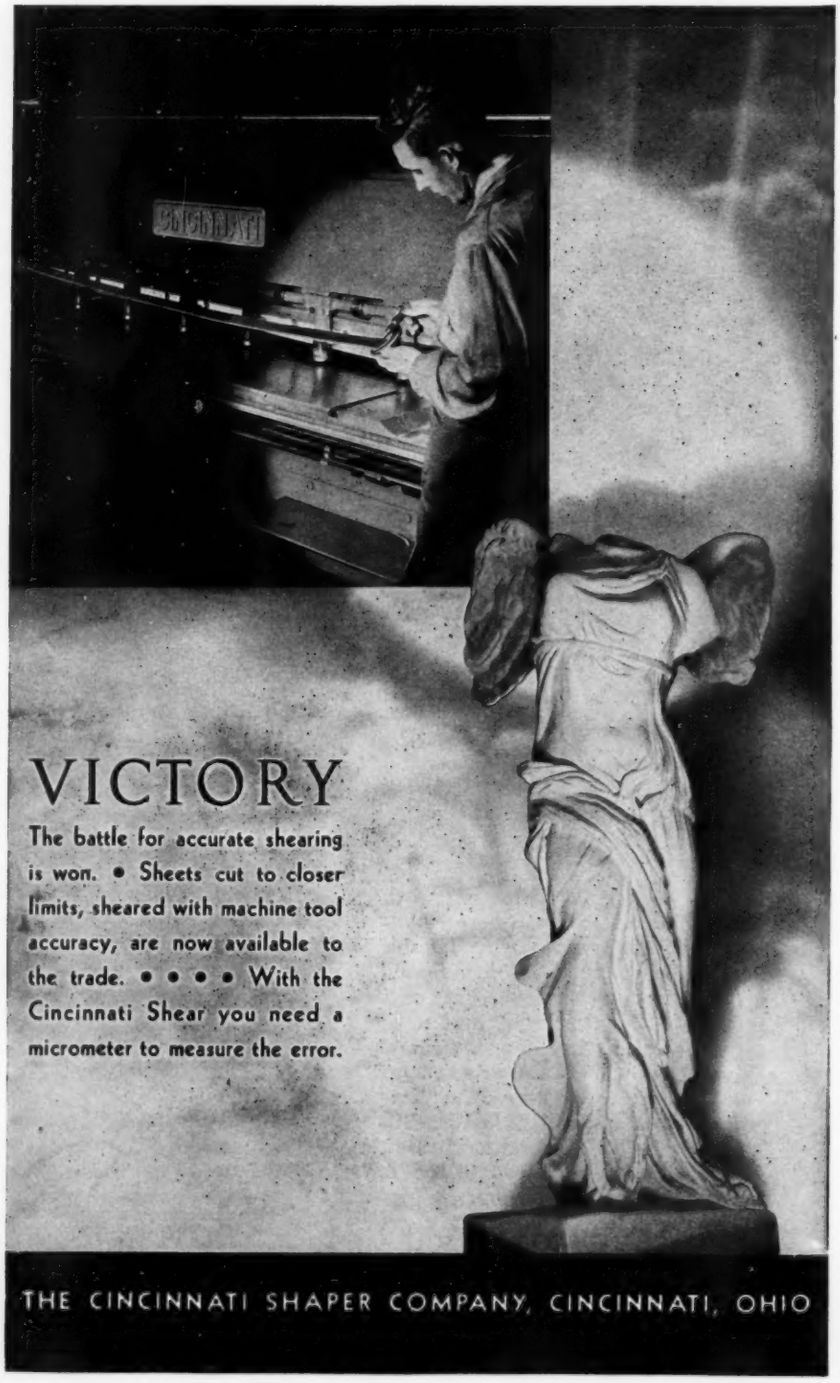
IRA S. WILLIAMS

CHARLES WESLOW (*AM*—Vol. 80, page 1079) explains various methods and procedures for precision grinding. Seldom, if ever, is a pair of micrometers accurate to a tenth over the entire one-inch range, and it is doubtful if any manufacturer of micrometers will guarantee his product to be that accurate. For close work, it is customary to use the micrometer only as a comparator by establishing the desired size with accurate size blocks and transferring the measurement to the work by measuring first the size blocks with the micrometers and then the work.

However, transferring measurements is not practical when applied where tolerances are as close as 0.00005 in., as obtaining the correct "feel" is impossible. The surface of the size block is accurately lapped, the full bearing surface causes a drag, and there is no physical distortion possible. Measuring the work, which is only ground, offers a different problem. No matter how fine the work is ground there are minute high spots, only a few of which contact the surfaces of the micrometer anvil and spindle. Therefore, to obtain the same "feel" that was secured on the size blocks, some distortion by tight "miking" will be necessary.

Incidentally, wiping both ground surfaces of the work on a dry cast iron lap will make the high spots readily visible, and it takes mighty little abrasion to lap 0.000025 in. from each side of the work and thereby scrap it.

As explained, I am sure Mr. Weslow did the best job possible with the facilities available, but I am also sure he would have been more sure of his measurements if he had had available an optical flat and monochromatic light and been given the opportunity to do a little lapping.


VICTORY
The battle for accurate shearing is won. • Sheets cut to closer limits, sheared with machine tool accuracy, are now available to the trade. • • • • With the Cincinnati Shear you need a micrometer to measure the error.
THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

Safety Sweeps

PERHAPS you wouldn't get much of a thrill if you drew such a balky sounding nag as "Stop, Look and Listen" in a real sweepstakes, but if you were an employee of the Acklin Stamping Company you might find that "Stop" had won you a cash prize. Or you might be on "Watch Your Step," "Safety First" or "Be Alert" with equal success. And the best of it is it wouldn't cost a cent.

The "Acklin Sweepstakes" is the company's way of profiting by the current interest in "sweeps" to promote safer working conditions. The contest makes use of a brightly

colored board depicting a race track divided into six lanes with miniature numbered horses on each.

Employees organize in groups to pick a horse, promote its progress day by day for 60 days around the course —one move each day for horses of the groups that have completed the previous day's work without an accident.

Any injury requiring medical treatment or a lost day costs that group's horse a move.

To keep "hard luck" employees interested the number of moves lost

for more than seven days lost time is limited to five, for an injury of from four to seven days, to four. This permits a group to get back in the running should others have a series of small misfortunes, and interest is maintained during the race.

The plant nurse is referee, and her decision regarding the seriousness of an accident is final. Ordinary first aid calls do not count.

Jockeys have been appointed in each division to whom employees can report hazards discovered in their departments or the careless operation of any individual.

Machinery 'Round the World

THE problem of inserting paper rolls in printing presses without stopping the press, has proved a knotty one for engineers. Now it has been solved by the Swedish General Electric Company, which has applied for a patent in all countries, and is preparing to market the invention.

•

Continuing its campaign to take the excess equipment from the British textile industry, the British Cotton Spindles Board, set up to liquidate over-capacity in the cotton textile industry of the United Kingdom has reported that out of a total of 46,900,000 "mule equivalent" spindles 6,200,000 have been completely idle for the last six months.

•

Scottish engineers are working on the problem posed for them by the development of a method of freezing fish at -10 to -20 F. The Torry Research Station, at Aberdeen, has been experimenting with the method of preserving fish, and finds that this procedure eliminates many of the faults of above-zero processes.

•

Formation of a company in Cuba for the canning of pineapples has been announced. The new company proposes to use fresh pineapples which cannot profitably be marketed in the United States, and intends to build and equip a canning plant in one of the larger pineapple producing districts of Cuba, near Havana. The plant is to be ready for production when the pineapple harvest begins next April.

•

Development of diesel mine locomotives abroad is the main topic of a report made public in Washington by the U. S. Bureau of Mines. The report reviews the developments in internal combustion engines, the transition to diesel engines, discusses operating problems and procedures, and finds the present status of development in France, Germany, Belgium and Great Britain.

•

Designed especially for fishing boats, a new type diesel engine is being produced by a Swedish firm, the S. G. Bolinders Motor Aktb, of Stockholm.

The motor is a two-cycle, with two cylinders, developing 254 hp. at 290 r.p.m., and weighs approximately 12,000 kg. The fuel consumption is reported to be 180 grams per hp. and the lubricating oil consumption is about two grams per hp.-hour. Average pressure is 4.3 kg. per sq.cm. The motor can be operated by one man at the steering wheel.

The above items have been adstracted from reports to the Machinery Division, U. S. Department of Commerce.

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Matrix Metal in Die Work

C. P. SAWYER
Cerro de Pasco Copper Corporation

IN THE series of articles on "Die Design and Die Making" recently concluded, E. G. Marshall makes the statement (*AM*—Vol. 80, page 627) that the use of matrix metal is not recommended for fine, accurate die work. It is appreciated that the words "matrix metal" include all of those metals such as solder, babbitt and lead which have been used for this purpose and which by their performance rightfully deserve the qualifying statement made. There is the possibility, however, that injustice has been done to the trademarked alloy "Cerromatrix" made by the Cerro de Pasco Copper Corporation.

Cerromatrix was developed by one of the large electrical manufacturing companies for the exact purpose described in the article, and it has no hesitancy in using it for the construction of dies required for fine and accurate work. It is used quite generally by electrical manufacturers, both large and small, for the construction of lamination dies, which is evidence as to the suitability of this material where accuracy and long life are of importance. In fact, an actual photograph of a die almost identical with Fig. 36, in connection with which the above statement was made, is shown in our booklet entitled "Cerromatrix a Material and a Method."

Moreover, three watch companies in this country are using the material in the construction of dies with complete satisfaction and definite economies. One of the large companies is using it in dies for blanking, piercing and trimming heavy gage steel up to $\frac{1}{8}$ in. in thickness. Between these two extremes there are hundreds of others using the alloy for standard die construction without any limitation as to the accuracy of the work to be performed or the length of time the die is to be used.

Leading Makers of
SHEET METAL STAMPINGS
depend on
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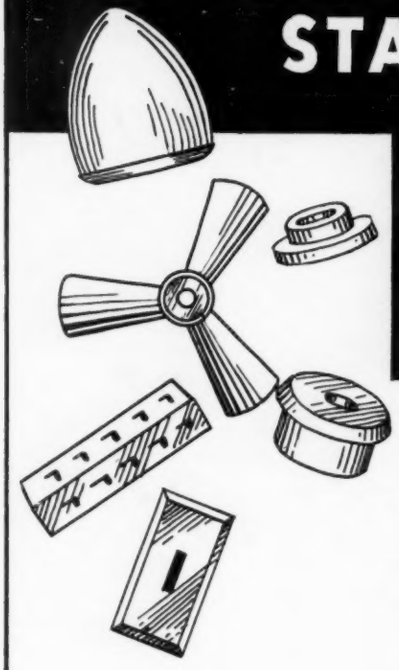
Cleaning



Every year more articles are fabricated of sheet metal stampings. On many of these products such as automobile accessories, builders' hardware, lighting fixtures, metal furniture, etc., the finest lacquer, enamel, plated or other finishes are essential. To assure quality work, the FIRST requirement is an absolutely CLEAN metal surface.

Noteworthy in this connection is that leading makers of sheet metal products rely on Oakite materials to give them low-cost, trouble-free, thorough cleaning.

Let us help you improve results and lower costs in YOUR plant

You, too, can profit by the improvements and economies that dependable Oakite cleaning materials can establish in YOUR plant. So whatever the problem or cleaning operation, why not let one of our trained service representatives submit his practical suggestions for your product. Write today . . . no obligation.

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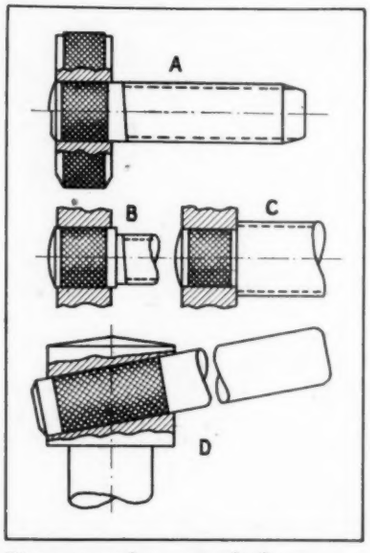
Knurled Thumbscrews for Tool Work

FRANCIS W. SHAW
Broadley, Lancashire, England

REFERRING to the article by Charles Weslow, under the above title (*AM*—Vol. 80, page 925), Mr. Weslow, rightly suggests making the knurled heads of thumbscrews separate from the bodies. But to go to the trouble of taper squaring the



Pieces turned to a push fit or to a light drive fit and then knurled will stay tight in their holes under all ordinary usage

screws and taper holing the heads does not seem a profitable way of joining the two parts.

In similar cases I have for long adopted the practice of knurling the infitting piece, which had previously been turned for a push fit or a light drive fit. Experience has demonstrated that the head never slips or comes loose. Indeed, once I had to separate the parts by drilling.

Referring to the illustration, *A* shows how the screws would be normally made. At *B* and *C* how the same head could be fitted to screws of different size. At *D* is shown another application in which a lever could be made from a bar of cold-rolled steel. A similar lever was successfully applied to a heavy turret for locking and clamping it. To those who doubt the holding power of knurled surfaces, I would mention another example. Mild steel gears of 8 pitch, 1¼-in. face and 1¼ in. through the hub and subjected to a torque of 480 in.-lb. were fitted to knurled shafts. They never failed.

Mr. Weslow mentions the necessity for pack-hardening the points of thumbscrews. My practice has been to make such screws of 0.6 carbon steel and to oil-harden the points. This steel is easy to machine when annealed; hardened it withstands hard usage without mushrooming. A tapered point will stand up better than a straight one and will not get gradually larger under pressure. The end should be well below the root diameter of the thread.

Solid Bushings Kept Tight

BRASS bushings in solid end locomotive connecting rods have a way of working loose in service. Some find that cutting a few narrow slots lengthwise in the bearing surface keeps them tight much longer. In fact some feel that this is the solution of the problem.

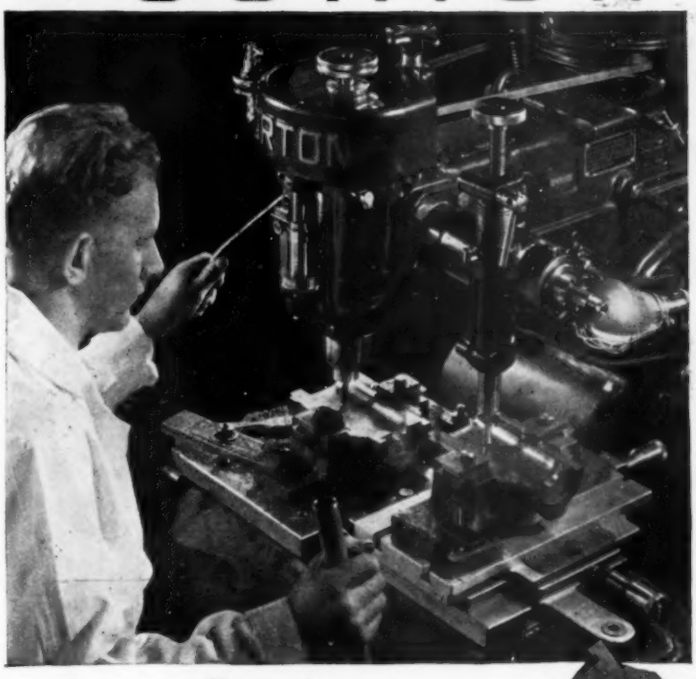
Another solution that is claimed to eliminate the difficulty is to make the bushing of steel, bronze and babbitt instead of using bronze alone. A steel shell carries a bronze bushing with flanges to take end wear. Inside the bronze is a babbitt lining about ¼ in. thick, deposited with a blower pipe in a recess that prevents it being squeezed out at the ends. This combination is said to prevent the loosening of the bearing in the rod. It is also said to be considerably cheaper.

Turkeys and Carbides

RECENT reductions of 50 per cent in the price of cutting carbides no doubt will have salutary effect in promoting their use in what heretofore have been considered marginal applications. Some of the price cut, however, is lost in the new method of figuring carbide weights by tipped tool suppliers.

Borrowing a practice from the butcher who weighs (and charges for) the Christmas turkey before dressing it, carbide weights are now computed on the nearest full size rectangular or round piece from which the tip can be made. This may not amount to much on a standard tip, which is nearly rectangular anyway, but on irregular shapes the added cost for ground away material may reach a good percentage of the whole. Even so, on most common tools the reduction represents a saving that should widen the use of carbides.

★ GORTON DUPLICATORS

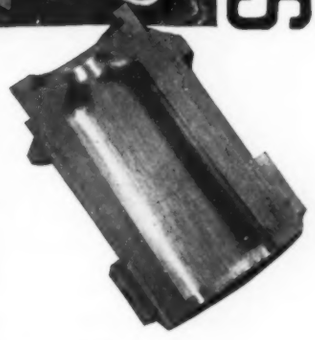


Once is Enough to

Make an Original Die

Production of dies and molds from drawings, even with the help of modern die sinking machines, takes time and skill, both expensive and tending to get more so. Why waste them by starting from scratch every time duplicates are needed?

You can cut in half or less the cost of making duplicate dies and molds with a Gorton Duplicator. Any good mechanic can reproduce from originals or masters within tolerances of .001". No pattern is too complex for them to follow accurately.



Example No. 1347

Bottle mold. Formerly routed out on milling machine in 2 hours. Finished to .003" of size on 8½D Duplicator in 25 min.

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NEW BOOKS

GEAR DESIGN SIMPLIFIED—*By Franklin D. Jones, associate editor of Machinery. 139 pages, 8½ x 11 in. Indexed and illustrated. Imitation leather binding. Published by The Industrial Press, 148 Lafayette St., New York, N. Y. Price, $3.*

Most of the pages of this book consist of a series of outline sketches indicating certain gear dimensions and opposite them the formulas or methods for finding particular proportions to suit engineering requirements. The reader is not supplied with a discussion of the theory of tooth profiles but rather with a series of work sheets intended to aid him in the practical steps of gear design.

All the usual types of gears are dealt with: spur, internal, bevel, spiralbevel, helical, helical for angular shafts (spiral), herringbone and worm. Most of the chapters are started by a page or two giving the general characteristics of the gears under discussion. These are followed by the diagrammatic treatment referred to above. Alternate solutions for a given problem are given when they are applicable.

A section on figuring speeds and ratios includes various planetary transmissions. Another section contains the rules for determining the power transmission characteristics of various kinds of gears. A table of standard DIN tooth modules with equivalent diametral and circular pitches is also included.

•

A.S.T.M. STANDARDS — 1936. PART I—*Metals, 898 pages, 6 x 9½ in. Part II—Non-Metallic Materials, 1477 pages. Published by American Society for Testing Materials, 260 South Broad St., Philadelphia, Pa. Prices for either part separately, in cloth $7.50; in half leather $8.50; for both parts in cloth $14; in half leather, $16.*

These triennial publications contain all of the standard specifications, methods of test, recommended practices and definitions formally adopted by the Society. In each Part, the specifications for a particular class of material are given first, followed directly by the test methods and definitions.

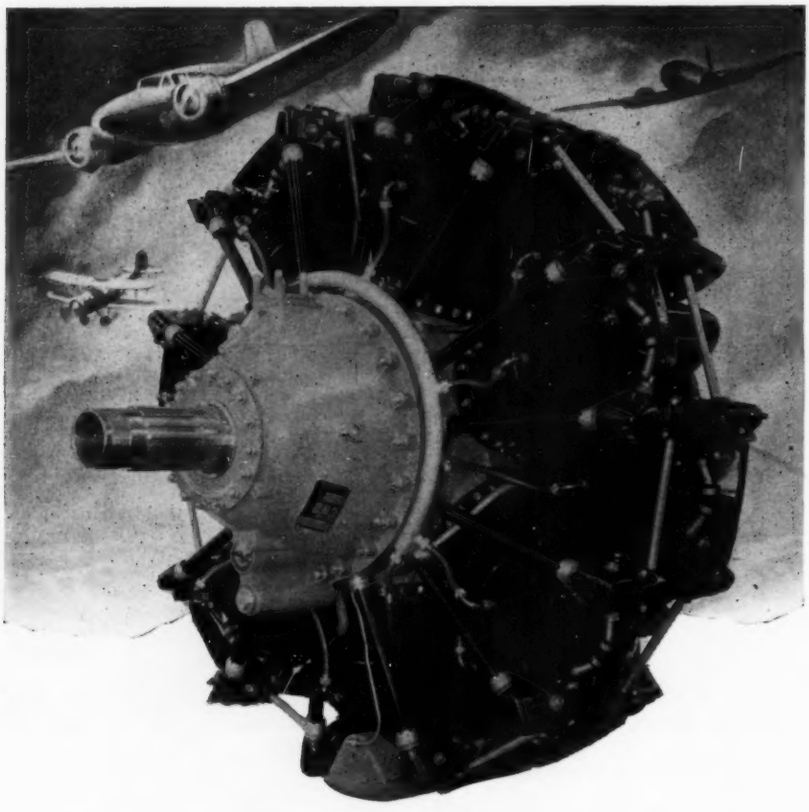
Of the 181 standards in Part I, 109 cover the ferrous metals, while 60 relate to non-ferrous metals. Twelve of the standards involve metallography and general testing methods.

Part II contains many new standards and revisions which were adopted during 1936 on non-metallic materials.

•

LESSONS IN ARC WELDING—*1937 Edition. Compiled and published by The Lincoln Electric Co., Cleveland, Ohio. 130 pages mimeographed on 8 x 10 in. sheets with simulated leather binding. Price: $.50, postpaid in the United States, $0.75 elsewhere.*

This manual takes the student through all the important phases of practical arc welding and affords him thorough instruction on the subject. The lessons cover: the arc welding machine, its operation and control; the shielded arc and its uses; striking the arc and running a horizontal bead; running a bead not less than 12 in. long; weaving the electrodes; effect of arc length, current and speed



Maximum motive power engineered into minimum space — this 1000 horsepower, double-bank, radial motor, by Pratt & Whitney. Weight, 1 pound, 4 ounces per horsepower. Needless to say, tools had to be as modern as the motor. Not surprising, then, that all tools, jigs, and fixtures were designed and built by Taft-Peirce. The facilities of this, the most famous toolroom in the world, are likewise open to *you*. Write for complete details today.

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on bead; effect of polarity on bead; various types of electrodes; butt welds; lap welds; vertical welds, and other pertinent subjects. Information is given on welding aluminum, bronze, brass, copper and 4–6 chrome steels.

The lessons are based on the course in arc welding that has been conducted by the company in its welding school for nearly 20 years and are the result of experience in teaching men to become practical arc welding operators. Widespread interest in the lessons is indicated by the fact that approximately 10,000 copies have been sold since original publication three years ago.

There are now 44 illustrated lessons, as compared with 28 lessons and some 60 pages in the original edition.

•

AIRCRAFT ENGINES — *By Arthur B. Domonoske and Volney C. Finch. 342 pages, 6 x 9¼ in. Clothboard covers. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price, $3.75.*

Basic theory and principles of aircraft-engine design and operation are presented in a manner intended to stimulate and to develop a spirit of investigation and self-reliance. A short introduction covering types of aircraft engines, trend of design and characteristics is followed by a chapter devoted to the thermodynamic theory of heat and gases. Internal combustion engine cycles and ideal engine efficiencies are described. Constitutents of petroleum fuels, the chemistry of combustion, and detonation and anti-detonants, and factors which affect combustion in aircraft engines are fully covered. Thermal efficiency, supercharging, waste heat, cooling and testing are other subjects treated.

•

ELECTRON TUBES IN INDUSTRY. *By Keith Henney, editor of Electronics. 539 pages, 6x9 in. Illustrated. Clothboard covers. Published by McGraw-Hill Book Company, Inc., 330 West 42d St., New York, N. Y. Price, $5.*

The purpose of this second edition is to acquaint industrial engineers with the many applications of amplifier, oscillator. photo tubes, rectifiers, thyratrons, grid-flow tubes and cathode-ray tubes to non-communication purposes.

After an introductory chapter on the fundamentals of electronic tube circuits, with a brief discourse on electron properties, electromotive force, laws of reactance, impedance and resonance, various types of thermionic tubes are discussed. In this chapter of 28 pages much is written and illustrated with line drawings to clear up the mystery, especially to the layman, that surrounds the functions of these electronic tubes.

The third and fourth chapters of well over 100 pages each on vacuum-tube amplifiers and gaseous triodes are similarly treated. Light sensitive tubes and applications of these tubes to industrial installations are covered in two chapters, while recifiers. cathode ray tubes and other miscellaneous tubes complete the text.

Throughout the book, the various types of tubes are illustrated with line drawings and photographs. There are many circuit diagrams, charts, tables and detail drawings of methods and industrial applications.

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TRADE PUBLICATIONS

BROACHING MACHINES. Bulletins 104-9J and 104-9K, announced by Colonial Broach Co., 147 Jos. Campau Ave., Detroit, Mich., illustrate and describe various standard broaching machines of twelve basic types and over 50 models. These machines cover the entire broaching field.

BROACH SHARPENING. Colonial Broach Co., 147 Jos. Campau Ave., Detroit, Mich., announces publication of Bulletin 1049-A describing and illustrating grinding machines for sharpening round, splined and flat broaches. Specifications are given for the two standard models.

ELECTRIC TOOLS. Catalog No. 899, recently published by Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., supersedes Bulletins 899 and 899-A. A complete line of portable electric tools is described in this 46-page catalog.

LIGHT-SENSITIVE CELL. General Electric Co., Schenectady, N. Y., has announced the publication of Bulletin GEA-2467, giving technical and descriptive data on G-E light-sensitive cells.

MECHANICAL TESTING. "Correlation Between Metallography and Mechanical Testing" is the title of University of Illinois Bulletin No. 31, Vol. XXXIV, by Herbert F. Moore. This is reprinted from transactions A.I.M.E., and is available at a price of 20 cents each.

PRECISION TAPPING. Bulletin 36-T, recently issued by R. G. Haskins Co., 4630 West Fulton St., Chicago, contains 16 pages and is fully illustrated. This bulletin describes the Haskins method of high-speed precision tapping and the various tapping machines offered. Air control for tapping machines is described.

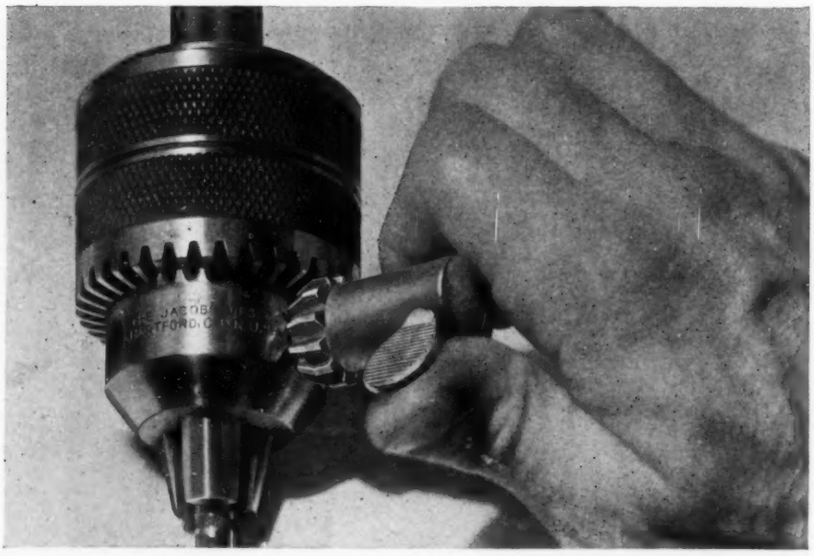
SCREW MACHINE TOOLS. The Banner Mfg. Co., 1873 Clybourn Ave., Chicago, has published a 15-page catalog showing their cams and tools for automatic screw machines. Each type of tool is illustrated and specifications are listed.

STEEL. A 68-page catalog, issued by A. R. Purdy Co., Inc., 790 Greenwich St., New York, N. Y., lists the various steels carried in stock. Several convenient tables of useful information are included. A convenient thumb index makes the catalog easy to use.

TEMPERATURE RELAYS. Type ICT, self-reset, temperature relays are described in Bulletin GEA-2525 offered by General Electric Co., Schenectady, N. Y. These relays are used to protect a.c. machines and transformers against overheating.

THREADING AND WELDING. The Oster Mfg. Co., 2057 E. 61st Place, Cleveland, announces publication of a catalog covering the entire line of Oster-Williams pipe and bolt threading equipment and standard welding fixtures. This 76-page catalog is well illustrated and lists specifications for the various products.

UNIT HEATERS. Leaflet TC-30, offered by Harold E. Trent Co., 618-640 N. 54th St., Philadelphia, lists and describes the Trent electric unit heaters. The different styles are illustrated and control diagrams are shown.



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